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TEACHER'S GUIDE

Numbers We See

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THIS IS THE TEACHING GUIDE FOR NUMBERS WE SEE, THE FIRST BOOK OF THE BASIC MATHEMATICS PROGRAM,
WHICH IS A UNIT OF THE CURRICULUM FOUNDATION SERIES.

THE AUTHORS OF THIS BOOK ARE MAURICE L. HARTUNG, PROFESSOR OF EDUCATION, UNIVERSITY OF CHICAGO;
HENRY VAN ENGEN, PROFESSOR OF EDUCATION AND MATHEMATICS, UNIVERSITY OF WISCONSIN;
ANITA RIESS, ASSOCIATE PROFESSOR OF PSYCHOLOGY, UNIVERSITY OF BRIDGEPORT, BRIDGEPORT, CONNECTICUT;
CATHARINE MAHONEY, FORMERLY A PRIMARY TEACHER IN THE DAVENPORT (IOWA) PUBLIC SCHOOLS;
AND A. B. EVENSON, GENERAL SUPERVISOR, SENIOR HIGH SCHOOLS, EDMONTON PUBLIC SCHOOL BOARD.

THIS BOOK WAS PREPARED BY THE EDITORIAL STAFF OF SCOTT, FORESMAN AND COMPANY
UNDER THE DIRECTION OF GEORGE E. RUSSELL, DIRECTING EDITOR OF THE BASIC MATHEMATICS PROGRAM.

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GENERAL DIRECTIONS FOR USING THE BOOK

In general, there are two kinds of material provided in *Numbers We See*: (1) pictures used to introduce, to discover, and to develop new number ideas; and (2) associated pictures, of a slightly more abstract type, used for giving practice in applying the new ideas. The related activities suggested in the lesson notes include not only auditory experiences and the manipulation of varied small objects or "counters," but also other kinds of activity (such as games, play, home and school experiences) all selected because of their rôle in developing number readiness.

This "picture number book" is, in fact, planned to provide a firm foundation on which to build later work with numbers. Instead of depending upon learning through reading, or drill with ab-

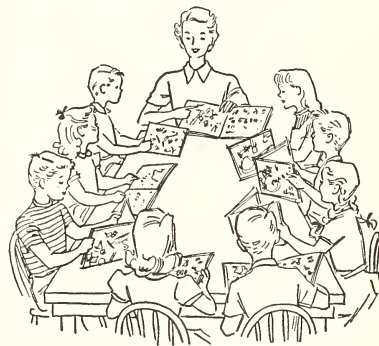
stract number symbols the emphasis throughout is upon visual experiences which are to be supplemented by activities using actual objects. Pupils can be helped to make discoveries about numbers and number relationships, and to think of numbers as a useful means of dealing with the world around them.

Detailed suggestions as to how each page of the book may be used will be found in later sections of this book. Hence this introduction will be limited to directions for planning and organizing the work in general. First, each child should have a copy of the book before him so that he can individually carry on many of the activities. For example, he may be asked to place markers on the open page in order to show he knows some number idea.

Second, in many cases the teacher will find it desirable to divide the class into two or three smaller groups and to work with one group at a time, as is now common in teaching reading. These groups may be formed on the basis of differences in number readiness found to exist among the children. With the smaller group, there is more opportunity for individual activity and participation, and the teacher can better observe the ability of the individual pupils to carry on the various activities and to respond correctly.

Third, the teacher should make certain preparations in advance of each lesson in which the book is to be used. As a first step, she should rapidly read through all of the suggestions for the lesson

in order to preview its scope. Then in a second, more careful reading she should review the purpose of each group of pages as indicated in the sections headed "Charting the Course." She should also know the objective each page is designed to help achieve. An explicit statement of the objective of each lesson is given under "Knowing Your Objective." Next, she should collect or prepare any related materials she will need in developing the lesson. These may include stories to be read or told, markers, "frames" which cover parts of a page while exposing other parts, and other kinds of materials. Story suggestions, and directions for preparing other materials, will be found in the sections headed "Preparing for Page ____." She is then ready to plan the details of the lesson.



The discussions under "Using Page ____" in these lesson notes are intended to be suggestive only. No attempt should be made to follow them word for word. If, however, full advantage is to be taken of the possibilities of *Numbers We See*, plans essentially similar to those given should be followed. The stories and pictures together help to establish a natural setting and motivation for the activities. They represent children's doings and interests at home, at school, at the store, and other typical places. One desirable modification of the suggestions given here arises when teachers enlarge upon these settings in terms of local examples. Also, many teachers have developed number activities of their own which may be introduced at appropriate times along with (or in place of) some of those suggested.

Finally, the pupils should be given opportunities for "Applying the New Concepts and Skills," and methods of doing this are outlined in sections under that heading. Such activities may extend over several days. Number readiness, like other aspects of arithmetic, is cumulative in that later concepts and skills are built upon the foundation of earlier ones. One of the best ways of knowing that the foundation is firm is to observe the ability of pupils to apply concepts and skills in situations different from those in which they were learned.

Teachers and others who may be interested in the theoretical background of the program provided by this book should consult *Number Readiness in Research*.¹ This annotated bibliography briefly summarizes the relevant portions of 143

¹ *Number Readiness in Research*, by Anita Riess. Scott, Foresman and Company, 1947.

research studies, articles, and books on this subject published in the United States, England, France, and Germany.

Three types of supplementary material, which may be used with this book, are available. They are the *Number Readiness Chart*,¹ the *Arithmetic Readiness Cards*,² and *Our Number Workshop 1*.³ They are all designed to give the child a variety of experiences to develop the concepts and skills presented in *Numbers We See*.

The *Number Readiness Chart* consists of four-teen separate charts and one perforated sheet of 97 cutouts. A photograph of each chart and a detailed lesson plan for its use are given on pages 8 to 35 of *Developing Number Readiness*, the guidebook to the chart.

There are two sets of *Arithmetic Readiness Cards*, Set 1: *Grouping*, and Set 2: *Number System*. Set 1 contains 54 cards printed on both sides with pictures of organized and unorganized groups from 3 through 10. Set 2 contains 54 cards printed on both sides with pictures showing groups of 10 objects and the necessary single objects for the numbers from 11 through 99 (and 19 cards for representative numbers in the hundreds), which can be used in teaching place value and the decimal nature of our number system.

Our Number Workshop 1 is made up of 96 Worksheets, each of which is correlated with a

¹ *Number Readiness Chart*, by Anita Riess and Maurice L. Hartung. Scott, Foresman and Company.

² *Arithmetic Readiness Cards Set 1: Grouping; Set 2: Number System*, by Maurice L. Hartung, Henry Van Engen, and Helen Palmer. Scott, Foresman and Company.

³ *Our Number Workshop 1*, by Maurice L. Hartung, Henry Van Engen, and Catharine Mahoney. Scott, Foresman and Company.

page in *Numbers We See* and gives the child independent practice with the concepts taught. Directions for the use of each Worksheet and a reference to the page in *Numbers We See* with which it may be used are included on the Worksheet.

3 Introduction to the book

KNOWING YOUR OBJECTIVE FOR PAGE 3

This page simply introduces the book and acquaints the children with the most important characters that will appear in the pictures. This page also presents an opportunity to discuss situations in which numbers are used.

PREPARING FOR PAGE 3

Have the following (or similar) books available or be familiar with the stories: *The Biggest Family in the Town*, *The Little Family*, and "Sleepy Sally" in *Sally Does It*. These are items 4, 22, and 38 in the bibliography.¹

If you plan to use the game described in the section below on "Applying the New Concepts and Skills," prepare enough sets so that there will be one for each three or four children.

INTRODUCING PAGE 3

Tell the children one or more stories like those mentioned above, and let them look at the pictures that illustrate the stories. Encourage discussion about the families in the stories and their activities. Then say, "We are going to meet a family that you'll like. They did many interesting things. I'm

¹ A complete bibliography of all stories and books referred to in these lesson notes will be found on pages 161-162.

going to give each of you a book that tells you what this family did." At this point give a book to each child. Let the children look through the books before directing their attention to page 3.

USING PAGE 3

Have the children open their books to page 3. It is always a good plan to show the page in your own book and to make sure that each child in the group has the correct page. Tell the pupils that this is the family they will learn about in this book. Proceed with such questions and directions as, "Who are the people you see in this picture? Name all of the people in your family." Let each child have an opportunity to name the members of his own family. Watch to see that a child does not omit himself. Continue much as follows: "You told me the names of the people in your family. Now I will tell you the name of each person in the family in the picture. Don't you think it will be easier to talk about them if they have names? Let's think up a family name for the people in the picture. We all know which is Father and which is Mother. Carol is the girl in the blue dress. Is she the oldest child? Why do you think so? The boy's name is Don. Their little sister's name is Nancy. What color is her dress?"

"What is Father doing? Who is playing with Father? Do you know what game they are playing? Did you ever play a game like that? Tell us how you played it." Do not attempt to have the children read the number symbols on this page.

Now call attention to Carol and her mother. "What are Carol and Mother doing? If you were going to make a dress for your doll what are

some of the things you would want to be sure to do before cutting the cloth?"

During the discussion of the picture the children probably have noticed and mentioned the clock and the radio. Lead them to discuss why numbers are necessary on both articles. "What time of the day do you think it is? What makes you think so? Do you know how to work the radio? Do you think the family in the picture is listening to the radio? Would you like to do some of the things the children in this picture are doing?"

APPLYING THE NEW CONCEPTS AND SKILLS

More activities are suggested for each lesson in the book than can be used in any one class. Select only those which can be used with the children in your class. If you have *Our Number Workshop 1*, you may find that it supplies sufficient supplementary material.

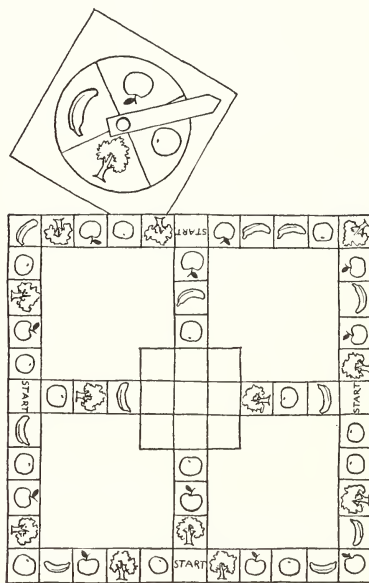
Page 3 serves as a means of introducing the book and motivating the work.

Show the children how to play the game shown on page 3 and illustrated at the right. These activities will help get their interests centered on the book and establish the relationships needed for group activity. In the game shown at the right let each of three or four children take turns in spinning the wheel and in moving his counter to the correct square. The winner is the child who reaches home first.

Encourage the children to make riddles about page 3 and about things in the classroom. The following illustrates the type of riddle desired: "I see something in the picture that has numbers on it, but it does not tell time. What do I see?"

The children's riddles should include a consciousness about the existence of numbers or quantity, but not specifically about any particular number or quantity.

Encourage the children to discuss uses of numbers they see in their homes: calendar numbers; numbers as used when Mother measures ingredients in cooking; the numbers on Daddy's automobile license; etc.



Charting the Course

The ideas *many* and *few* are number concepts which do not necessarily depend upon counting. The child can recognize that there are "many" objects in a group before he can count the actual number. He can also recognize the smallness of a group without knowing precisely how many are in the group. These crude concepts of *many* and *not many*, or *few*, therefore provide a convenient point from which a start can be made toward the more precise number ideas needed to answer the question "How many?"

The ideas *many* and *few* are relative. A set of objects may be considered many in one situation but few in a different situation. Also a group of objects which is few for one purpose may be many for another purpose. These relationship or comparison ideas are indicated by phrases like "many for" and "not many for" (or "few for"). Pages 4 and 5, and the activities suggested in the lesson notes, are to be used to bring out and clarify these ideas in the minds of the children.

4 Intuitive reactions to *many*, *few*

KNOWING YOUR OBJECTIVE FOR PAGE 4

The purpose of this page is to provide the child with opportunities to react to *many* and *few* without counting. See "Charting the Course" immediately above.

PREPARING FOR PAGE 4

Some of the activities described below require oaktag, 24" x 36", and drawing paper, 12" x 18". Have available some old magazines from which children can cut pictures illustrating *many* and *few*. Three or four sheets of drawing paper for each child and two sheets of oaktag are desirable.

Have available *Millions of Cats* or *Nappy Wanted a Dog* (items 27 and 29 in the bibliography).

INTRODUCING PAGE 4

Read or tell *Millions of Cats* or *Nappy Wanted a Dog*.

Discuss informally with the children such questions as: "Do you know what time it is when you go to bed? Is it dark at that time? Have you ever looked up at the sky just before you hopped into bed? Is there any difference in the way the sky looks at night and the way it looks in the daytime? What is the difference?" Keep questioning until you receive the answer that the moon and stars are out at night but that the sky is light and the sun is shining in the daytime.

"What else is different at night and in the daytime? What do we do at night so that we can see in our houses? Have you ever looked out at night and seen lights in the houses?"

USING PAGE 4

Tell the children that there is a page in this book that shows what Carol, Don, and Nancy see when they look out of their bedroom windows at night. Show the children page 4 in your book and assist them to find it in their own books.

Let the children look at the picture for a short time without any comment or questions. This will enable them to see the picture as a whole before you begin to direct their attention to specific details. Permit them to talk about what they see. Ask different children to tell about what they see in the picture. Encourage them to look for as many different things as possible. Let them speculate about where Carol, Don, and Nancy live.

Now ask the children if they see anything in the picture that shows a great many. Some are certain to mention the stars. Then proceed with such questions as: "Would it be easy to count all the stars? Can you think of any word that would tell that there are a great number of stars in the sky? Do you see anything else in the picture that makes you feel like saying, 'Oh! so many'?"

Direct attention to objects in their environment that are many. Ask them to name something in the room that makes them think of *many*. Let the children name all the things they can think of that mean *many* to them. Among these will be such things as many branches on a tree, many dishes in the cupboard, many flowers in the garden. If they have any difficulty, give them a little help by naming some things for them.

After you are sure that the children have a clear understanding of the word *many*, continue

by asking questions that will lead the children to use the word *few*. "What does the sky look like on a cloudy night? Do you see any stars? When you can see a star here and a star there, do you see many stars? Tell me about the number of stars you see." Continue until they use the word *few*.

Then ask the children if they see anything in the picture that shows *just a few*. "Can you think of anything in this room, on the playground, or at home that makes you think of *just a few*? When you think of something that makes you think of *few*, stand up." If no one stands up in a short time, help them by standing up yourself and giving an example. Let each child have the opportunity to give at least one example.

Now direct their attention to the picture again. Tell them that you are going to name things you see in the picture and that you will ask them to tell you whether they see many or few of each thing you mention. Among the things you can mention are stars, houses, lights, windows, trees, leaves, church, chimneys, moon, apples. Be sure to give each child at least one opportunity to respond. Let each child explain why he says "few" or "many" for each thing mentioned.

Finally request each child to bring to school tomorrow two pictures cut from old magazines or papers showing *many* and one showing *few*. Have a few old magazines around so that children who forget to bring pictures can find some. All should take active part in the discussion that results from looking at these pictures.

APPLYING THE NEW CONCEPTS AND SKILLS

Use one or more of the following or similar activities for more practice for the *many, few* lesson.

Direct the children to bring to school pictures from magazines that show *many* and *few*. Provide magazines for those who do not bring pictures.

Make two charts for the front of the room. Heavy paper or oaktag (24" x 36") may be used. One chart should be called the "many chart." The other chart should be called the "few chart." Then let each child take turns deciding whether a picture he has should go on the chart for *many* or *few*. Some pictures could go on either chart, but the child should give a reason for putting it on one chart.

Another good activity is to have the children follow such oral directions as: "Susan, give John a book with many pages in it." After the child has done as directed, ask her to tell why she thinks the book has many pages. "Henry, bring Sally many pieces of drawing paper. Judy, bring me a few pieces of chalk. Ann, give Billy a few crayons." Be sure that each child gives a reason for his decision. The objective should be to make the children see that the use or situation may determine whether a certain collection of things is *many* or *few*. After they have responded to such directions given by you, let them take turns giving similar directions to other members of the group.

Provide each child with a piece of drawing paper (12" x 18"). Show the children how to fold the paper into four sections. Tell them to think of each section as a box. Then give directions

similar to the following: "This is box one. In box one draw just a few trees for a forest. This is box two. In box two draw many apples for you to eat. This is box three. Draw many eggs for your breakfast in box three. This is box four. Draw a few chairs for your class."

Furnish each child with another sheet of drawing paper. Show them how to fold the paper into two sections. Then tell them to draw a picture that shows *many* in one section and a picture that shows *few* in the other section. When the pictures are finished, have each child tell the group what his picture shows and explain why his picture shows *few* instead of *many* or *many* instead of *few*.

Make up riddles like the following and let the children answer them. "I am thinking of something in this picture that you see in the sky at night. What am I thinking of? Are there many or few of them in this picture?"

If *Our Number Workshop 1* is available, Worksheets 1 and 2 can be used with page 4 in addition to, or instead of, some of these activities.

5 Many, few

KNOWING YOUR OBJECTIVE FOR PAGE 5

This page continues the work on intuitive reactions to *many* and *few* and introduces the relative use of these words.

PREPARING FOR PAGE 5

Before beginning work on this page be sure to have on hand for each child in the group some small paper bags or boxes containing quantities

of objects to illustrate *many* and *few*. One box or bag might contain a few checkers, others might contain many marbles, a few crayons, many pens, many buttons, a few jacks, etc.

Provide each child with four objects to serve as markers. These may be circles or squares of colored cardboard, checkers, buttons, or any small objects.

If you plan to use the suggestions outlined under "Applying the New Concepts and Skills," it is also a good idea to have ready work sheets, each with one of the following simple objects drawn or reproduced on it: a house with no windows or doors, a tree without leaves, a landscape, a vase, etc. Duplicate enough of these so that every child can have one of each.

Another activity will require for each child a copy of one or more pages each containing sixteen groups of objects illustrating *many* and *few*. These copies can be made from a master drawing done in hectograph ink. Divide the master page into 16 equal sections. Then in each section draw (or stamp with rubber stamps) objects to illustrate *few* and *many* (few chairs, many marbles, few marbles, many birds, few birds, etc.).

INTRODUCING PAGE 5

Begin the work by recalling page 4 and the night scene. Ask such questions as, "What did we talk about then? What were the two words we used that told about the number of things we saw in the picture?" Tell the children that they are going to talk about some things that Don and Carol saw and did the next day. Tell them that they are going to use the words *many* and *few*

again. Review the words *many* and *few* by giving the children directions requiring repeated actions. "Clap your hands many times, Jack." "Hop on one foot a few times, Jane." "Beat with your pencil on the desk many times, Billy." "Jump up and down a few times, Ann." After each child has had an opportunity to perform according to directions, proceed with the work somewhat as follows.

USING PAGE 5

Have the children open their books to page 5. Show them the page in your book. Tell the children that Don and Carol and two of their friends are on this page. Let the children look at the pictures on this page for a few minutes, then direct their attention to the first picture.

Direct attention to the picture of the two boys by asking questions. "What toys does Don have? What toys does Henry have? Why is Don having so much trouble with his toys? How would you carry Don's toys? Why doesn't Henry have any trouble? What word can we use about Henry's toys? [Few] What word can we use about Don's toys? [Many toys for one boy] Which boy would you rather play with?" Let the children give reasons for wanting to play with whichever boy they chose. Now have the children put a marker on the little boy who has many toys. Tell the children to leave the marker there until later.

Now ask the children what they see in the next picture (at the top of the page). If they have trouble finding the picture, show them the picture of the trees in your book. Tell the children to describe what they see in the picture by using the words *many* and *few* (many leaves, few trees,

many birds in one tree, few birds in the other tree). Tell a story similar to the following: This spring many birds flew back from the south. Two birds came to the tree in our yard. "Let's build a nest here," said the father bird. "It is a nice big shade tree and will be a fine place to raise our babies." Other birds came to the tree, too, and thought the same thing. Soon there were many, many birds in that big shade tree. None of the birds wanted to leave; so they all stayed for a whole day and tried to decide which birds should build a nest in that tree in our yard.

Let the children tell stories explaining why there are many birds in the one tree in the picture and only a few birds in the other. Have the children put a marker on the tree that has only a few birds in it. Check to see that each child has marked the correct tree.

Next direct the children's attention to the picture of the doors. Ask them to tell what they see. Stimulate discussion by questions. "What do you see in this picture that seems funny?" Try to get the answer "many bottles for one house." "Do you think there are many children in that house? Why? Put a marker on the door with many bottles." Check the position of the markers. The markers are to remain on the pictures.

Continue in a similar manner with the last picture. Ask such questions as: "What are Carol and her friend doing? Which girl has many jacks? Isn't that too many jacks for one girl to play with? Which girl has few jacks? Is it fun to play with just a few jacks? Why not? Should Carol let the other girl play with some of her jacks? Should

she let her friend have many jacks or few jacks?" Tell the children to put a marker on the picture of the girl with few jacks. Be sure all the children have marked the correct picture.

After this work has been finished, direct the children to look at the pictures again. "Which boy has the marker on him, the boy with many toys or the boy with few toys?" "Which tree does not have a marker on it? [Be sure they use *many* and *few* in their responses.] Which door has a marker on it?" "Which girl has a marker on her?"

Finally tell the children to look around their houses or to look at pictures in magazines to discover things that are *many* or *few*. Be sure to give them the opportunity the next day to tell about their discoveries.

APPLYING THE NEW CONCEPTS AND SKILLS

One or more of the following or similar activities may be used for later lessons to strengthen the meaning of *many* and *few*.

If the bags or boxes filled with a few things and many things are available, let each child select a bag or box and take it to his seat. Each child will be interested to see what his bag or box contains. Have each child tell what he has. Be sure he uses the words *many* or *few*. For example, he might say, "There are many buttons in my box." The child should then display on his desk the contents of his box. The children in the group will then decide whether or not he gave the correct answer. Proceed in this way until all the boxes or bags have been used.

Provide the children with the work sheets (described earlier) that have simple objects drawn on

them (house, tree, etc.). Give oral directions to the children as follows: "Draw a few windows on the house. Make many branches on the tree. Draw many birds flying in the sky. Put a few flowers in the vase." Check the papers with the children.

Charting the Course

A step beyond the crude concepts of *many* and *few* can be made by using simple pairing or matching. The idea expressed by "as many as" can be made clear if the objects in two groups can be paired, or put in *one-to-one* correspondence. When the matching is completed and some objects remain unmatched in one of the groups, ideas like "not as many as," "more," "too many," "fewer," "too few," can be expressed. In many life situations the words or phrases "enough," "more than enough," "not enough," are also used to indicate the outcome of a matching or comparison activity. Although this pairing, or making a *one-to-one* correspondence between groups, does not require a knowledge of the number words, it is an essential part of number readiness. It is, in fact, a preliminary step toward meaningful counting. Pages 6-9, and the activities suggested in the lesson notes for these pages, are designed to help pupils develop these important concepts.

6 - 7 Simple pairing; matching one series of objects with another

KNOWING YOUR OBJECTIVES FOR PAGES 6 AND 7

On these pages the child will receive experiences that require both manual and auditory responses to the ideas of *enough*, *all*, *not enough*, *as many as*, *not as many as*, *more*, *fewer*, *too few*, *too many*, *more than enough*. These experiences will be restricted to matching or pairing one series of objects with another series without counting.

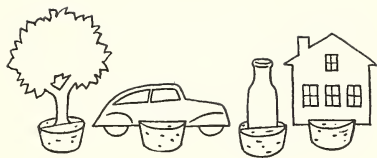
The work sheets with the sixteen simple pictures can be used with such directions as, "Put a green X on the pictures that show *many*. Now put a red X on the pictures that show *few*."

Worksheet 3 of *Our Number Workshop 1* can be used with page 5.

PREPARING FOR PAGES 6 AND 7

If all the activities suggested for these pages are used, have at hand for each child in the group five markers like those described in the preceding lesson. Have also several sheets of construction paper for each child, six old newspapers, and five envelopes.

Interest will be much enhanced if each child is supplied with a set of markers like the ones on the next page. These markers can be made by cutting corks in half horizontally, and inserting in



slots cut in them cutouts of milk bottles, houses, trees, cars, and groups of persons. Each set should consist of five of each object. Small corks dipped in vegetable coloring make very colorful and practical markers.

One activity will require for each child a copy of an illustration showing five houses in a row.

Also have available five or more blocks or small boxes, preferably all different in size, shape, or color.

It is a good idea to have at hand items 10, 30, and 31 in the bibliography, or to be familiar with the stories (or similar stories) referred to in the notes below.

If the *Number Readiness Chart*¹ is available, Chart 1 can be used in connection with this lesson. It should be used before pages 6 and 7 are introduced. Follow the procedures outlined in the *Guidebook* for the chart.²

INTRODUCING PAGES 6 AND 7

Everybody Has a House and *The New House in the Forest* are stories that may be read to the children before starting work on pages 6 and 7.

¹ *Number Readiness Chart*, by Anita Riess and Maurice L. Hartung. Scott, Foresman & Co.

² *Developing Number Readiness*, by Anita Riess and Maurice L. Hartung. Scott, Foresman & Co.

Let the children discuss the houses mentioned in the two books above. Then put five blocks or boxes on the table or floor in front of the group. Say to the children, "If these boxes were five lovely houses all in a row, with shade trees and flowers and beautiful yards around them, which house would you choose to live in?" Let them show you by pushing forward one of the boxes to indicate the house of their choice. Then let anyone who wishes describe the house he lives in.

USING PAGES 6 AND 7

When the books have been properly opened, direct attention to the houses and let the children look at the picture for a while. Then ask them: "Which house would you like to live in? Why? Which house do you think Don, Carol, and Nancy live in?" Let the group decide upon a house for the family.

Now give each child five markers (the markers with the cutout persons, if available). "Pretend that each one of these markers is a family. Put a family in each house." Some of the children may not understand what you mean. It may be necessary to show them what to do. "Do you have any families left? Were there just as many families as houses? Do you think each family has a car?" To find out, direct them to move a family from each house to a car. "Did you use all the markers? Are there as many cars as families?"

"Now let's find out if each family has a garage for their car. Which house does not have a garage? Are there as many garages as cars? What will the family that has no garage do with their car?" Let the children discuss various possi-

bilities. Undoubtedly some child will suggest the double garage as a solution. Then ask, "What is a double garage?" Now tell the children to play that their markers are cars, or better, if special markers have been made for the cars and other items, use the car markers. Proceed as follows: "Now put a marker on each car. Move each car to a garage. Did you use all of the cars? Are there enough garages for each car?"

Have the children move a marker (called a car) from each garage to a driveway. "Do you have any cars left over? How does it happen that there are enough garages for each car but not enough driveways?" Keep questioning until you get the right answer. Then have the children remove the markers.

Tell the children that there is something that appears in each yard. Let them talk until they agree that it is a tree. Let them discover by using markers that there are just as many trees as houses, more trees in front yards than in back yards, fewer houses without bushes than with bushes, etc. Encourage the use of the vocabulary items listed at the beginning under "Knowing Your Objective."

Additional work with these pages should be left for subsequent days.

Begin the next day's work by asking, "Can you think of any people who might bring things to the families in these houses every day?" If the children do not understand what is meant, mention the grocer and the mailman. Then keep questioning and helping until they mention the paper boy. A good story to read or tell at this point is "The

Newsboy" in *People Who Come to Our House*. Permit the children to talk about delivering papers.

Continue somewhat as follows: "How would you like to play that you are paper boys today? You can play you are delivering papers to the families in the houses in the pictures. I will be paper boy first to show you how to play the game." Drop to the floor, one at a time, the newspapers you have, rolled up in regular newsboy style. Tell the children that every time they hear a paper drop they are to put a marker on a house in the picture. Corks or small folded papers are the best markers to use with this activity. Now drop five papers, then ask, "Do you have as many markers as houses? How do you know? Did we deliver a paper to each house? How do you know?"

Continue the activity by dropping only three papers. "Did all of the houses get papers this time? Were there enough papers?" Encourage the children to respond by using the expressions "not enough papers for all the houses," "more papers are needed," etc.

Be sure to drop six papers before concluding this activity. This should result in the use of such expressions as "too many papers," "more than enough papers," etc. Conclude the activity by letting the children take turns being paper boy.

The following extension of the activity described above removes the assistance of visual perception and requires reliance on auditory perception. Ask the children to close their eyes and then to put markers (small rolled-up pieces of paper to represent delivered newspapers may be used) on their desks as you drop papers. Be sure to drop the

papers audibly. Use such directions and questions as, "Now open your eyes and move each marker to a house in the picture. Did all of the families get a paper?"

As a variation of this type of activity, direct the children to close their eyes, then touch each child a given number of times. Have each child put down a marker while being touched. In this way you can check to see if the child has made the correct response. If the class has been divided into small enough groups, each child can have a turn.

The procedures described in connection with the delivery of papers can be used in similar activities involving delivery of letters by the mailman, milk by the milkman, etc.

APPLYING THE NEW CONCEPTS AND SKILLS

Let the children make five houses and garages of match boxes, blocks, oaktag, or small boxes. They can paint doors and windows on the boxes. They can make trees out of oaktag or construction paper and staple them together so that the trees will stand up. They can use toy cars or cut them out of oaktag and insert them in half corks. They can make "play" newspapers, letters, and milk bottles. All these things can be used as markers. Then the children can play paper boy, mailman, or milkman by putting the objects on the "houses."

Have the children make up riddles like the following: "I live in a red house. We have a garage in which you can put two cars. Put a marker on my house." "There are not enough garages for all the cars. Put a marker on the car that does not have a garage of its own."

Supply each child with a work sheet showing five houses in a row (drawn in hectograph ink and duplicated or cut from magazines and pasted on the page) and a plain sheet of paper. Tell the children to draw on the plain sheet of paper just enough trees in a row so that there will be one for each house. Tell them to look at a house and then draw a tree. Give them similar directions to draw other objects (automobile, cat, dog, etc.).

Worksheet 4 of *Our Number Workshop 1* can be used with pages 6 and 7.

8 Simple pairing

KNOWING YOUR OBJECTIVE FOR PAGE 8

This page also deals with simple pairing and is designed to give additional experiences with the ideas of *too few*, *too many*, and *more than enough*. It continues to emphasize matching of one series of objects with another series as a basis for the understanding of counting.

PREPARING FOR PAGE 8

Provide for each child eight objects to serve as markers. These objects may be disks of cardboard, checkers, buttons, corks, small stones, etc.



Some of the activities require clay, construction paper, and a few paper plates and napkins.

Chart 2 of the *Number Readiness Chart* can be used at the end of this lesson.

You may also wish to have on hand bibliography items 16, 17, 38, and 45.

INTRODUCING PAGE 8

If there is time, read or tell the children one of the following stories: *Happy Birthday, Judy*; pages 32-35 in *The Happy Family*; "Come to My Party" in *Sally Does It; Surprise for Davy*. Be sure to get the children in the group to talk about parties by asking questions: "How many of you have gone to a party? What kind of party was it? What did you do at the party? What is one thing you usually have at a party?" Let the children tell something about the parties they have attended.

USING PAGE 8

Have the children open their books to page 8. Help them find the page if necessary. Tell them that Carol is having a party to which she has invited some of her girl friends. Lead the children to express their opinions as to the kind of party the girls are having. Ask questions like the following. "Helen, do you think it is time for the girls to come to the table? Why not? Sue, do you think there are enough chairs for all the girls?" Let the children discuss these ideas for a short time. Then give each child five markers. Buttons work well as markers on this page. Proceed with matching activities suggested by the following directions and questions. "Put one marker on each girl that you see in the picture. Be sure not to omit Carol, the little girl who is having the party. What is Carol doing? Now pretend that the markers are girls."

"Play that you are having each girl sit down at the table. Move each girl to a chair. Are there

too many chairs? Are there too few chairs? Are there just enough chairs?"

"Now we will see if Carol has enough glasses for all the girls. We found that there was a chair for each girl. So we will move a marker from each chair to a glass. Andy, are there enough glasses? John, are there too many glasses? Jane, are there more than enough glasses?"

"Take the markers from the glasses and put one on each girl again. Do you think Carol will need to bring in more plates? Let's find out. Move a marker from each girl to a plate. Jack, what did you find out?"

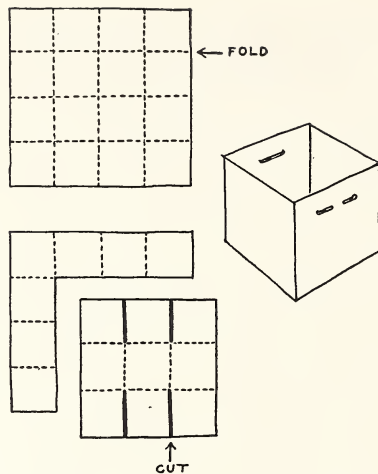
"Let's find out if there are enough cupcakes on the table for each girl to have one. Put a marker on each cupcake that is on the table. Now move a marker to each girl. Are there too few?" Use this same procedure for the cupcakes that Carol is placing on the table.

"Do you think that there is going to be anything to eat besides cupcakes and milk (or lemonade)?" Continue questioning until someone discovers there are a few spoons on the table. "What else do you think they are going to eat? Put a marker on each spoon. Now move it to a girl. Are there more than enough spoons? Are there enough spoons? Show me the markers you have left. Will Carol need to bring in some more spoons?"

At the conclusion of the work on page 8 let the children pretend that they are at Carol's party. Have the children sing "Happy Birthday" to Carol.

APPLYING THE NEW CONCEPTS AND SKILLS

Divide the children into small groups and let each group prepare for a small party. Let them



make a sufficient number of things needed, such as place cards, napkins, table mats, etc. Nut cups can be made very easily by the children. Direct them to take a square piece of paper and fold it into fourths in each direction. This will make sixteen small squares. They can then cut away part of the squares so that nine remain. Have them cut the corners as shown in the pictures above. The paper will fold very easily into a cup shape. The ends can be pasted or stapled together. The children can use a matching procedure to see how many they will need. First they can put a marker down for each child in the group. Then they can make one of each object for each marker. They

can set the places for mid-morning milk instead of having a party.

Have the children make dishes of modeling clay for their party, according to your directions, to use for setting the table. The number to be made is to be determined by the use of markers as explained above. As another activity let each child show how he would set the table at home for his family. Give him a piece of drawing paper to serve as the top of a table. Then tell him to put a marker on his desk for each member of his family. He should then draw on the table top a plate, a cup, a saucer, etc., for each person. Tell him to move his markers to the plates, cups, etc., to see if he has enough, too many, or too few.

Let the children cut out paper plates, glasses, cupcakes, etc., for each member of their group. Then have them put the objects on their desks according to such directions as: "Put a plate on your desk for each of the girls in your group."

Use Chart 2 of the *Number Readiness Chart* if it is available. Follow the suggestions for Chart 2 given in *Developing Number Readiness*.

Worksheets 5 and 6 of *Our Number Workshop 1* can be used with page 8.

9 Simple pairing; use of *as many as, not as many as, more, fewer*

KNOWING YOUR OBJECTIVE FOR PAGE 9

This page continues the work of establishing an understanding of counting as a matching procedure. Additional experiences are given in simple pairing and matching things to things. Emphasis

is placed on the meaning and use of such expressions as: *as many as, not as many as, more, fewer*.

PREPARING FOR PAGE 9

Have available five markers (buttons, disks of cardboard, etc.) for each child in the group. You may need several sheets of paper for each child to use in making the objects described in the first activity in "Applying the New Concepts and Skills."

Be sure to prepare for each child a copy of the work page described later and the 24" x 36" oak-tag illustration if you plan to use the activities described in "Applying the New Concepts and Skills."

INTRODUCING PAGE 9

Let the children discuss briefly what happens at home after a party is over and everyone has gone home. Lead them to a discussion about putting things away, especially assembling things that belong together.

USING PAGE 9

Have the children open their books to page 9. Ask them what Carol and her mother are doing. As a result of the preceding discussion the children will say that they are straightening up after the party. Tell the children that they are going to find out whether or not everything has been found by Carol and her mother. The procedures should be such that the decisions are made as a result of pairing or matching of object to object by means of counters.

Begin by asking, "What are some of the things the girls played with at the party?" Then proceed by using directions and questions similar to the following. "You will use your counters to find out if Carol and her mother have found everything.

Put a marker on each doll." Check to see that each child has done this. Be sure they do not overlook the doll that Carol has. Do not warn them about this, but let it be a "surprise discovery." "Now let's pretend that we are putting the dolls in the buggies. Move a marker from a doll to a doll buggy. Is there a buggy for each doll? Are there enough buggies? Do you think Carol has found all of the buggies? Why?"

"Put the markers back on the dolls. It's late. Let's put the dolls in their beds. Move a marker from a doll to a doll bed. Why can't you put all of the dolls in their beds? Are there more beds than dolls or fewer beds than dolls? How do you know? Where do you think the other beds are?"

"Let's find out if Carol took off all the dolls' dresses before putting them to bed. Put your markers back on the dolls again. Move a marker from each doll to a dress. How do you know that there are more dresses than dolls? Could Carol put a dress on each doll? Would she have any dresses left over?" Let the children offer reasons explaining this. They should decide one doll has two dresses.

"I wonder if Carol took off all the hats. Put the markers on the dolls again. Move a marker to each doll hat. Should Carol hunt for more hats? Why?" Get the children to use the expressions "fewer hats than dolls," "not as many as," etc.

The same kind of activities can be carried out for the groups of jacks and balls. Tell the children that usually there is a ball for each group of jacks. Ask the questions in such a way that they will have to answer using the expressions "as many as," "not as many as," "more," and "fewer."

Proceed in the same way with the paintboxes and paintbrushes.

APPLYING THE NEW CONCEPTS AND SKILLS

Help the children make for a party such things as nut cups, napkins, place cards, place mats, etc. Control this activity so that there will be just enough of some things, too many of some, and too few of others to supply one to each in the group. Let one child give a place mat to each child in the group (or to as many as have cups). Another child can then give out the nut cups, etc. After each item has been distributed, let the children discuss the result in terms of "just enough," "not enough," "too few," "too many," "we need more," etc.

Divide a piece of oaktag (24" x 36") into four parts by heavy lines. In one section draw or paste pictures of 3 objects (balloons, apples, houses, etc.), in another section draw 5 objects, in another, 4 objects, and in the remaining section, 2 objects. Make each object slightly different in appearance. Provide each child with a piece of drawing paper and a pencil or crayon. Put the large picture in a prominent and stable position before the group. Then give them such directions as the following. "Look at the balloons. Draw as many balloons as there are in this picture. Be sure to look at a balloon, then draw a balloon, then look at the next balloon, and so on. Draw fewer trees than there are in this picture. Draw more apples than there are in this picture. Draw more houses than there are in this picture." Include as many variations as you can. Both sides of the paper may be used.

The following activity will require for each child a copy of the work sheet described. Divide the

paper into four sections. In the first section draw 5 balloons and 4 strings. Arrange balloons and strings so that they cannot be easily paired. Leave space to draw an additional string. In the second section draw 5 kites and 3 tails. In the third section draw 6 cups and 5 saucers. In the fourth section draw 3 boats and 2 sails. A similar arrangement of objects may be shown on the other side of the paper. Direct the children to put a marker on each balloon. Tell them to move a marker from each balloon to a balloon string to see if there are as many balloon strings as there are balloons. Then let each child decide whether he should cross out the balloons for which he does not have strings or draw more strings. Continue in the same way with each group of pictures. Be sure the children use markers or match object to object.

Charting the Course

The comparison concepts introduced in the preceding pages have been associated with groups of objects. They lead to readiness for meaningful or rational counting. A somewhat different set of concepts is associated with measuring. Ideas like *tall*, *short*, *long*, *big*, *little*, *wide*, and *narrow* are often applied to only a single object. These crude comparison concepts should be well developed before a child is expected to answer questions such as "How tall is she?" or "How long is it?"

These concepts, like *many* and *few*, are also relative. Thus a child who is tall compared with his playmates is short compared with his parents. Children (and adults) develop rough standards for comparison by becoming accustomed, through experience, to averages. For example, after seeing many dogs they can tell whether a particular dog is "big" or "little." Page 10 and the suggestions in the lesson notes provide opportunities to learn or apply these concepts.

Give each child in the group 5 markers. Then show 5 pencils at one time. Ask the children to put a marker down for each pencil you show. Now have them do the following by checking with their markers. "John, will you hand me as many pieces of paper as I have pencils? You have a marker for each pencil. That means that you can give me as many pieces of paper as you have markers. Nancy, put on your desk fewer crayons than there are pencils. Alice, I wonder if you can bring me more books than there are pencils. Jack, do we have fewer books than children?" Continue with similar directions.

Let the children talk about things at home that are lost, broken, or incomplete.

Worksheet 7 of *Our Number Workshop 1* can be used with page 9.

10 *Tall, short, long, big, little, small*

KNOWING YOUR OBJECTIVE FOR PAGE 10
See "Charting the Course" on page 84.

PREPARING FOR PAGE 10

Supply each child with five small markers. The activities suggested at the end of these notes require the following: one sheet of paper (9" x 12") for each child; two pieces of oaktag (24" x 36") on which apple trees are to be drawn; a few paper clips; copies for each child of one or more of the work pages described in the notes.

If possible, have available a copy of *Where Are the Apples?* to read to the children. (Item 50 in the bibliography)

INTRODUCING PAGE 10

Read or tell the story *Where Are the Apples?* to the children. Let the class talk about the story and about their own activities in connection with picking apples or some similar experience.

USING PAGE 10

Have the children open their books to page 10. Tell the group that this is a picture of Father, Mother, and the three children in their yard. Let the children talk briefly about the picture and what they think the family is doing.

Use questions and directions like the ones that follow to get the children to use the expressions "tall," "taller than," "shortest," "smaller than," "as tall as," "just tall enough," etc. These questions and directions should also require the children to make decisions based on an understanding of such expressions. "Is Father tall enough to reach

the apples at the very top of the tree? Do you think Father can reach the apples at the top of the tree when he is on the tallest ladder? What is the tallest thing you see in the picture? What is the biggest thing in the picture? Is Father as tall as the tree? Is the ladder Father has his hand on taller than he is?"

"Do you think Nancy would be tall enough to reach the apple on the lowest limb if she climbed on the smallest ladder? Is Don tall enough to reach the apple on the lowest branch? Is Don taller than Nancy? Who is taller, Carol or Don? Is Mother as tall as Father? Which ladder do you think Mother would stand on to pick apples? Is it the tallest ladder? Which ladder is taller than the ladder Mother would stand on? Why do you think Mother would stand on this ladder? Who is the shortest person? What is she doing?"

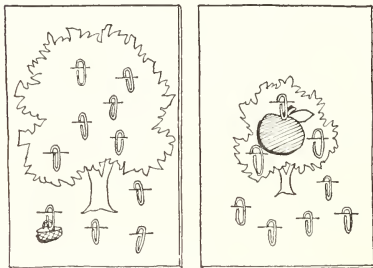
"Look carefully at the picture again. Are all the baskets the same size? Can you find a basket in the picture that is just as big as another basket in the picture? Put markers on these baskets." Check this and then have the markers removed. "Now put a marker on the largest basket. Is it bigger than the two baskets that are the same size? Move your marker to the smallest basket. Is it smaller than the two baskets that are alike in size?"

"Are there enough baskets for each person to carry one into the house? Pretend that your markers are apples. Put an apple in the basket that Father should carry. Put an apple in the basket Mother should carry. Put an apple in the basket Nancy should carry. Who should carry the basket that is the same size as Mother's?" The

children will conclude that Carol and Don together should carry it. "If all the baskets were empty, which one do you think would hold most of the apples that are left on the tree?"

APPLYING THE NEW CONCEPTS AND SKILLS

Have each child fold a sheet of paper (9" x 12") into four sections. Then have them draw pictures in the sections (called boxes) according to directions. "Draw a tall tree in one box. Draw a ladder that is taller than the tree beside the tree. In the next box draw a big apple and a little apple. In another box draw a big basket. Now beside the big basket draw a box that is smaller than the big basket. Next draw a basket that is just as big as the last basket you drew. In this same box draw a small basket that is smaller than any of the other baskets you drew. In the last box draw a long train. Now draw a train that is shorter than the long train you just drew."



The illustration gives a rough idea of the charts that should be prepared for the activity described

below. On one piece of oaktag (24" x 36") draw a large apple tree; on the other piece draw a smaller tree. Cut little slits in the trees and on the ground at the bottom of the trees at various places. Insert paper clips in the slits. Prepare and color several drawings of apples, ladders, and baskets cut from oaktag. These cutouts should consist of a smallest, a largest, two or more of equal size, and several of other varying sizes for each object. Put these cutouts on the table beside the charts. Then have the children follow directions such as: "Put the biggest apple on the small tree. Put the smallest basket under the biggest tree. Put the shortest ladder by the tallest tree." All kinds of questions such as these can be used to see how well the children understand the expressions and concepts developed in this lesson.

Provide duplicated pictures of all sizes of ladders, baskets, apples, chairs, trees, toys, etc. Direct the children to color the pictures according to directions. "Color the tallest tree green. Color the smallest apple red. Color the shortest ladder purple," etc. Or direct the children to put an X on the smallest picture, a circle around the tallest tree, a line under the biggest window, put an X on the largest chair, etc.

Provide for each child a sheet of paper with pictures of an apple, a tree, a door, a chair, a flower, etc., drawn on it. Then give directions: "Draw a tree that is smaller than the one on the paper. Draw a door that is bigger than the one on the paper," etc.

Worksheets 8, 9, and 10 of *Our Number Workshop 1* can be used with page 10.

Charting the Course

The child has up to this point been receiving a general introduction to the use of number. He has reacted to groups as "many" objects and as "few" objects. He has also been making a one-to-one correspondence between one series of things and another series of things (up to 5) as a preliminary to rational counting. The next step in his readiness program is to become thoroughly familiar with the model groups 2, 3, and 4. He should learn to recognize immediately without counting groups of 2, 3, and 4 objects. The child's understanding of these model groups will enable him later to break up and identify larger groups. Pages 11 to 15 and the activities suggested in the lesson notes for those pages develop this basic ability.

11 Two and three

KNOWING YOUR OBJECTIVE FOR PAGE 11

The purpose of this page is to help the child develop the ability to recognize groups of two and three objects immediately without counting.

PREPARING FOR PAGE 11

This page can be used to greatest advantage with a device which is called a "frame," which is used to cover some of the pictures while exposing others. The frames may be purchased¹ or made from oaktag. The picture on page 87 shows the exact size of the frame and how it should look. Use the picture to make the children's frames by making a tracing of it. Be sure to put a circle at the top of one side and a star at the top of the other side. Provide enough frames so that each child in a group will have one. Use of this full-

¹ These frames may be purchased from Scott, Foresman and Company in unbroken packages containing 25 frames and 25 windows (see pages 101 and 103).

page frame will add to the teaching value of this page and to the children's interest. The frame may also be used with pages 23, 39, 46, 54, 55, and 66.

If the full-page frame just described is not used, provide each child in a group with a single-view frame. This single-view frame can be made of oaktag or paper. It should be 6" by 4½". Cut out a rectangular opening 2¼" by 1¾" in the center of it. This frame can then be used to show one picture at a time. Keep these single-view frames for use with later pages.

Always have at hand a quantity of small sticks, buttons, checkers, corks, circles or squares of paper, or other suitable counters.

Charts 6 and 7 of the *Number Readiness Chart* will be very useful.

You also should have at hand items 3, 11, 13, 37, and 43 in the bibliography or be familiar with the stories (or similar stories) referred to in the notes on page 88.

Remove each of these rectangles by cutting on the black lines.



Draw a small black circle
in this position on reverse
side



INTRODUCING PAGE 11

Before starting work on page 11 read one or more of the following stories to the children: *Bear Twins*; "The Three Little Pigs" in *First Nursery Stories*; *Flicka, Ricka, Dicka and the New Dotted Dresses*; *Snipp, Snapp, Snurr and the Buttered Bread*.

Ask several children to recite the rhyme "Jack and Jill." If no one knows the rhyme, recite it to them. Then ask questions about the stories and the rhyme like the following: "How many children went up the hill? Who were they? Make a mark on the board for Jack. Now make a mark for Jill. Any kind of mark will do. Do you know the story of the 'Three Little Kittens'?"¹ Repeat a little of the poem to them and suggest such activities as: "Show me with some of these sticks [or other objects] how many little kittens there were. Make a mark on the blackboard for each kitten mentioned."

If the *Number Readiness Chart* is available, do the work suggested in the manual, *Developing Number Readiness*, for Charts 6 and 7. These two charts will reinforce understanding of 2 and 3 as groups.

USING PAGE 11

Tell the children to open their books to page 11. Show them the page in your own book. "I am going to give each of you one of these frames to put on your page. Find the blue circle on your frame." Show them the circle. "Put the frame over page 11 so that the circle is at the top." Be sure that each child has his frame turned the right way. If necessary, fasten the frame to the book with a paper clamp or clip.

Begin by asking questions about the pictures. "What do you see in the first picture?" If some children look at the picture at the right and say "two cars," tell them to look at the picture at the other side of the page. "Do you remember the story about Mother Bear, Father Bear, and Baby Bear? How many bears are in the story? Which one do you think is not in this picture?"

"What do you see in the other picture at the top of the page? How many of you have a car like these? How many cars are there in the picture?" Now direct the children's attention to the bicycle. "Do you see anything in this picture that makes you think of two?" If no one notices the two wheels, keep giving hints until the children give the desired answer. "How many of you can ride a big two-wheel bicycle? Can you think of any other toy that you can ride that has two wheels?"

"In the next picture you see something that boys like to play with. What is it? How many of them are there?"

"Does John or Helen [use names of children in the group] play with toys like those in the next picture? Are these dolls twins?" If they do not understand the meaning of *twins*, explain it to them. "Do any of you have twin dolls?"

"How many little yellow ducks do you see? How many kittens do you see? How many rabbits do you see?"

Now lead the children by means of questions to arrive at the conclusion that the pictures they have been looking at show 2. Such questions as the following may help. "How many objects are

in each little picture? John, name all the things that you see with your frame on the page." Be sure that he includes the idea of 2 in his descriptions.

If the frame is not used for this page, proceed from picture to picture (showing twos only) in the order indicated above. Questions similar to the ones above may be asked about each picture. Be sure, though, that each child is looking at the correct picture before the questions are asked. Another device used by some teachers is to provide the children with rectangular pieces of paper which can be placed over the pictures showing threes while their attention is being directed to the pictures showing twos. Still another device that may be used with this page is the single-view frame described at the beginning of these notes. Direct the child to place this frame on the page so that the picture under discussion at the time may be enclosed by it.

The above book activities may be all that can be done at one time, depending on the ability of the group. If so, this is a good point at which to break the work. The remaining activities described below can be continued on subsequent days.

The frame (or other devices) should next be used to lead the children to generalize about the groups of threes they see. Begin by telling the children to turn the frame over and to put it on the page with the star at the top. Show them how. Then proceed with questions like the ones described for the twos. Finish with the conclusion that they see threes this time. It may be necessary for you to help the children to see the three in the picture of the tricycle.

¹ The Rainbow Mother Goose. See bibliography item 37.

The next step will be more difficult and will involve distinguishing between groups of 2 and groups of 3 and will lead to the generalization that they see twos and threes. The frame is placed with the star at the bottom. Be sure that each child has his frame properly placed. Then ask questions like the following. "What do you see in the first picture? Can you find the whole bear family in any picture? How many bears are in the family? Can you now tell which bear was missing in the first picture you looked at?"

"What do you see in the next picture in the top row? Find another picture that has cars in it. Are there the same number of cars in both pictures? Which picture has more cars in it? Find two more pictures that have the same things in them. What are they? Are there the same number of kittens in each picture? What other things do you see in the pictures? How many are there of each?" Be sure the children use the words *two* and *three* to describe the number of objects in the pictures.

There is a fourth position of the frame that will provide the occasion for additional responses. Direct the children to place the frame so that the circle is at the bottom of the page. Ask questions similar to those just described.

Finish the work with the book by removing the frames and having the children respond to questions and directions like these: "Henry, name all the pictures that show two." Be sure he names the objects from left to right and from top row to bottom row. Let each child have an opportunity to do this. "Now, Mary, name all the threes."

As a final activity have the children model with clay or draw or cut from paper two copies of one object in the pictures on page 11 and three copies of another object in the pictures.

APPLYING THE NEW CONCEPTS AND SKILLS

One or more of the following or similar activities may be used for subsequent lessons to reinforce the concept of 2 and 3.

Provide on the bulletin board or another suitable place two large sheets of oaktag or heavy paper (about 24" x 36"). Tell the children that one sheet is to be used for pictures of twos. Draw a picture of two objects or animals at the top of one sheet to distinguish it from the other sheet, which is to be used for threes. Request the children to bring pictures from magazines showing twos and threes. Fasten the best ones on the charts with paste.

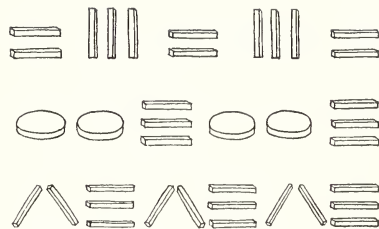
Provide each child with a sheet of paper on both sides of which groups of two and three objects or animals have been drawn or hectographed. Direct the children to color (with suitable color) all the twos on one side and all the threes on the other side.

Have the children make arrangements of sticks or other objects, using groups of twos and threes. The illustration at the top of the next column suggests a few such arrangements.

The children can draw or finger-point designs showing twos and threes.

The illustration at the right shows how a frieze can be made of groups of two and three objects cut from paper by the children.

Worksheet 11 of *Our Number Workshop 1* can be used with page 11.



12 Two and three

KNOWING YOUR OBJECTIVE FOR PAGE 12

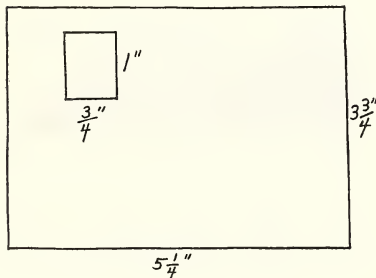
This lesson will give the children experiences in selecting groups of 2 and 3 from larger groups and in differentiating between such groups.

PREPARING FOR PAGE 12

Provide for each child a single-view frame, like the one shown in the picture below. If these frames are made of suitable material, they can be used by several groups many times.

Have on hand 15 to 20 jacks and marbles.

The activities at the end of this lesson require: A work sheet for each child showing pictures of many jacks, marbles, or other small objects; an oaktag chart on which pieces of wallpaper containing many small figures have been pasted; a piece of transparent paper (7" x 10") for each child; a supply of gummed parquetry papers, three or four for each child; a piece of oaktag (24" x 36"); crayons.



INTRODUCING PAGE 12

Recall to the children their experiences with 2 and 3 on page 11 and tell them that they are going to do some more work with 2 and 3. Ask them what game girls usually play with a ball and something else. Someone will probably say "jacks." Tell them that they are going to play jacks for a while to see how many twos and threes they can find. Give each child an opportunity to scatter the jacks or small stones and to find groups of 2 and 3. The class should be divided into groups of ten to fifteen children for this lesson. In this way each will have a turn and will keep interested in the lesson.

Now ask the children what game boys play that is something like jacks. If no one mentions "marbles," give some hints such as, "You don't need a ball," and "You make a big ring on the ground." Let one child tell how the game is played.

USING PAGE 12

Now have the children open their books to page 12. Show them page 12 in your book. Ask them what Don and his friend are doing. Then identify the upper left picture as "picture one." Proceed with the lesson by asking questions and giving directions. Supply each child with a single-view frame.

"In Picture One how many marbles are on the outside of the ring? Do you see any groups of 2 inside the ring? Take the little frame you have and put it so that the brown-haired boy's head shows through the opening. Now move the frame so that you can see just the two marbles that are on the outside of the ring. Take the frame away

and see if you can find another group of 2 marbles. Put the frame back so that just those 2 marbles show. Take the frame away and find another group of 2."

You can easily look around to see if the children are framing just 2 marbles each time. A superior group will undoubtedly be able to find many different groups of 2 by splitting some of the groups of 3. But the slower children will perhaps only be able to find three groups of 2.

Identify the upper right picture as the "next picture." "John, how many marbles are on the outside of the ring? Put your frame on the picture and show just these 2 marbles. Find another group of 2 marbles inside the ring. Put your frame on the picture so that just those 2 marbles will show." Continue this as many times as you think necessary. Encourage the superior children to find unusual groups. Do not expect the slower children to find any except the very obvious ones.

Identify the lower left picture as the next one. "Find a group of two outside the ring. Put your frame on the picture so that just those 2 marbles show through the opening. Take the frame away and see if you can find another group of 2 marbles outside the ring. Put the frame on and show them to me. Take the frame away again and see if you can find a group of 2 inside the ring. Put the frame back on and show me just those 2 marbles." Have the children do this several times.

"Let's look at the last picture now. Find a group of 2 marbles outside the ring. Put your frame over the picture so that only those 2 marbles show. Take the frame off the picture. See if you can find

another group of 2 inside the ring. Show it through the opening." Continue until they have found all the groups of 2.

"Now let's look at Picture One again." Show them the picture again. "This time find a group of 3 marbles in this picture. Show it through the opening. Take your frame away and find another group of 3 marbles. Put your frame on so the 3 marbles will show."

Continue the same procedure for all the other pictures. The slower children will undoubtedly need some help in finding groups of 3 in the last two pictures. After they have found as many groups of 3 as they can, continue the lesson somewhat as follows.

"Do you usually use so many marbles when you play this game? Could you play with that many jacks? Why is it easier to play jacks with fewer jacks? Why is it more fun to play marbles with many marbles?" Let several children express their opinions.

Now continue with as many of the following activities as you feel necessary to achieve a complete understanding of 2 and 3.

APPLYING THE NEW CONCEPTS AND SKILLS

Let the children actually play marbles and jacks again. As they play have them point out the various groups of 2 and 3.

Prepare work sheets that show jacks or marbles in different groups of 2 and 3. Direct the children to draw a red circle around all the groups of 2 that they find. Now direct the children to draw a blue circle around all the groups of 3 that they find.

Some wallpaper patterns show very good arrangements for groupings of 2 and 3. Paste sections of such wallpaper on a sheet of oaktag (24" x 36"). Put this chart on the table or floor. Then let the children take turns drawing red circles around groups of 2 and blue circles around groups of 3. You can ask individual children to mark a 2 or 3 as directed.

Supply each child with a piece of transparent paper and show him how to place it over the picture on page 12. It may help if the four rings are drawn on the tissues in black before the children receive them. Tell them to draw circles around groups of 2 and 3 on the paper using different colored crayons.

Give each child three or four gummed parquetry papers. Let the children take turns pasting them on a sheet of oaktag (24" x 36"), which is on the table or floor. Let each child paste his parquetry papers wherever he wishes. Then direct the children, one at a time, to draw a ring around a group of 2 or 3, as you direct. Be sure they use one color for 2 and another for 3.

Worksheet 12 of *Our Number Workshop 1* can be used with page 12.

13 Two and three

KNOWING YOUR OBJECTIVE FOR PAGE 13

This page teaches the child to select groups of 2 and 3 according to characteristics the items have in common, like color, size, shape, activity, etc., instead of using the position of the items.

PREPARING FOR PAGE 13

Have available one of the following (or similar) stories: "The Playground" in *The Magic Stairway*, "The Playground Director" in *People Who Work in the Country and in the City*, *The Unlike Twins in the Park* (items 25, 32, and 46 in the bibliography).

Provide each child with three markers. See pages 79-80 for a description of markers.

Have available some old magazines from which the children can cut pictures of boys and girls or boys' suits and girls' dresses. Two or three sheets of oaktag (24" x 36") will also be needed. One activity requires collections of small objects of various sizes, colors, and shapes (sticks, stones, marbles, buttons, corks, jacks). Provide for each child a frame (as described in the lesson notes for page 11) and a sheet of drawing paper.

INTRODUCING PAGE 13

Read or tell the children one or more of the stories mentioned above. Ask them if they have ever gone to a playground where there were many things to play on. Ask them to describe some of the things that usually are on playgrounds. Let them have an opportunity to express their opinions as to why so many children go to the playground. Let the children tell what they would prefer to play on at the playground. Those children who have never seen a playground might tell what they think they might enjoy doing on such a playground.

USING PAGE 13

Show the children page 13 in your book. Have them open their books to that page and proceed somewhat as follows.

"Ann, name all the things you could do on this playground. Are there many or few children on this playground? Do you think the children are having a good time? Do you see Carol, Don, or Nancy on the playground? What are they doing?"

"Find 2 boys who are dressed exactly alike. Put a marker on each boy. What are they going to do? Remove your markers."

"How many children are playing on the slide? Put a marker on each child who is on the slide. How many markers did you use this time?" Let the children decide that three children are on the slide. "Remove your markers. Now put markers on the children who are just on the steps of the slide. Did you use the same number of markers? How many did you use this time? How many swings are there on the playground? Put a marker on each swing. Remove your markers. Now put a marker on the girls that are swinging. How many girls are swinging?"

"How many children are playing in the sandpile? Put a marker on each child in the sandpile. Now leave markers just on the boys in the sandpile. How many are there? Now put markers on the children who are kneeling in the sandpile. Did you use the same number of markers?"

"What else do you see on the playground that we haven't talked about? How many girls are on the seesaws? Put markers on the girls that are on the same seesaw."

"Find a group of three children that are playing on the same thing. Put a marker on each child. Remove your markers. Now find another group of three children that are playing together. Put

your markers on them." Continue in this manner until all the groups of threes have been noticed.

"Look at the picture to see if you can find some girls that have on dresses of the same color." Give the children in the group an opportunity to tell the colors of the girls' dresses. "Find the girls that have green dresses. Put a marker on each of these girls. How many markers did you use? Put a marker on each boy that is dressed in green. How many boys are dressed in green? Are more boys or girls dressed in green? How can you tell?"

"Find a group of boys who are dressed in blue." Be sure the children include the boy on the swing. "Put a marker on each boy in blue. On how many boys did you put markers? Remove your markers. Now put markers on the girls who have on blue dresses. How many girls have on blue dresses?"

"Find the children who are dressed in yellow. Put a marker on each child in yellow. How many children are dressed in yellow? Remove your markers. Now put a marker on the girls who are dressed in yellow. Are there more girls than boys dressed in yellow? How many girls are dressed in yellow?"

"Find the girls who are dressed in red. Put a marker on each girl. How many girls are in red?"

Finish the work on this page by asking each child to put markers on a group of 2. Then ask him to tell why or how he chose the group. Also direct each child to put markers on a group of 3 and to explain why he put them where he did. This activity will serve as a test of ability to select groups of 2 and 3 by characteristics other than position.

APPLYING THE NEW CONCEPTS AND SKILLS

Give the children oral directions: "All of you who have on blue sweaters stand up. John, how many girls have on blue sweaters? All boys who have on green shirts stand up and clap your hands. How many boys were in this group, Ann?" Be sure that your directions will produce groups of 2 and 3.

Direct the children to cut pictures of dresses and boys' suits or of boys and girls out of magazines and to paste them on a sheet of oaktag (24" x 36"). Put this chart before the children. Then ask each child in turn to pick out a group of 2 and a group of 3. Let the children point to their selections and give reasons for grouping them. As a variation, the cutout objects may be laid out on the table and the children told to select a group of 2 (or 3) to paste on the chart. Groups should be pasted together. Other kinds of pictures may be used (fruit, vegetables, toys, etc.).

Give each child a miscellaneous collection of small objects (sticks, stones, marbles, buttons, corks, jacks). Then direct them to select or arrange the objects into groups of 2 and 3, putting in each group objects that belong together.

Furnish each child with a frame (see description on pages 86-87) clipped to a piece of drawing paper. Arrange the frame so that the circle is at the top. Have the children draw objects in the openings according to directions: "In opening one draw 2 apples. In the next opening draw 2 trees." Continue in this manner for all the eight openings, giving directions to draw groups of 2. Then tell them to turn the frame over so that the star is at the top of the page. Some children will

be able to do this by themselves but others will need help. Now give directions to draw objects in groups of 3.

The papers resulting from the above activity can be used later for coloring.

Worksheet 13 of *Our Number Workshop 1* can be used with page 13.

14 Two and four

KNOWING YOUR OBJECTIVE FOR PAGE 14

This page develops the ability to recognize groups of 4 and to differentiate immediately, without counting, between groups of 2 and groups of 4.

PREPARING FOR PAGE 14

There are a safety film strip, a song, and a record that can be used in connection with this page. The title of the film strip is *When You're Watching a Parade*, the song and record are *Sing a Song of Safety*. See items 41, 42, and 49 of the bibliography for further details. Item 48 in the bibliography, *Wait for William*, will prove useful.

If possible, provide rhythm-band instruments (drums, triangles, bells, tambourines, sticks, etc.). Also have available collections of small objects (marbles, stones, jacks, buttons, etc.).

Provide for each child a work sheet divided into sections, each containing pictures of 2 or 4 objects.

One activity requires three sheets of oaktag (24" x 36"). Provide four markers for each child.

Chart 8 of the *Number Readiness Chart* can be used to advantage in connection with this page.

INTRODUCING PAGE 14

Show the children the safety film strip (items 41 and 42) if it is available. Read or tell the children the story about *Wait for William*. The film or story (or a similar story) will interest the children in the work with the parade picture that follows.

Before opening the book, tell the children that the family is going to a circus and that on the way to the circus they stopped to watch the circus parade. Then let the children open their books to page 14. Show them the page. Let the children discuss parades in general and circus parades in particular.

USING PAGE 14

After the children have discussed the circus parade start the lesson for page 14 by letting them discuss the picture. Then direct attention to details by questions. Responses to the questions can be given orally or indicated by markers. The best results will be obtained by using the spontaneous discussion resulting from the observations of the children, asking questions merely to bring about the desired ideas. The examples listed below are merely suggestive of such questions. They should be given only after the children have reacted to the item in the picture.

"Find our family. Where is Nancy? Do you see any sign in this picture that might tell the way to the circus? What is on the sign? The sign is on the left side of the page." Show the children the left side of the page. "What else do you see on the left side of the page? How many stop lights are on the left side of the page? Where are the stop lights on the left side of the page?"

"How many wheels are on the bicycle on the left side of the page, John? Who is the man standing on the left corner? How many balloons does the man have in each hand? How many balloons does he have in both hands? Does he have the same number of balloons in each hand? Does he have any more balloons to sell? Where are they? Are there as many balloons in the stand as the man has in both hands?"

"Look at the store window. It is on the right side of the picture. What do you see in the window? How many toys are there in all the corners of the window? What do you see on the left side of the store window? What do you see on the right side of the window? How many corners does the window have? How many engines do you see on the train? How many cars are on the train? What else do you see on the right side of the picture? How many men are playing horns? How many children are standing on the corner on the right side of the picture? How many stop lights are on the right side of the picture? How many stop lights are there in all? How many corners are there on the street? What else is on the right side?"

"Now tell me what you see in the middle of the picture." Show the children the middle of the picture if they are confused. "The bar with the legs and the stripes on it is called a 'horse.' Why do you suppose the policeman put the 'horse' there? How many white stripes are on the left side of this horse? How many white stripes are on the right side? How many legs does the horse have?"

"What else do you see in the middle of the picture? What are the clowns doing? How many

clowns are there? How many wheels were on the wagon when they started? How many wheels are on the wagon now? What happened to one of the wheels? How many clowns are riding?"

"How many drums are there? How many men are carrying the drums? How many men are hitting the drums with drumsticks? Why do you think two of the men are helping to carry the drum?"

"What is the policeman doing? How many people are crossing the street? How many children are crossing the street? How many grown-ups are crossing the street? How many children are standing on the corner? How many girls are there on this corner? How many boys are there?"

APPLYING THE NEW CONCEPTS AND SKILLS

Use Chart 8 of the *Number Readiness Chart* as directed in *Developing Number Readiness* to give practice in identifying groups of 4.

Let the children have a parade. Rhythm band instruments can be used. Be sure the children are grouped in twos and fours. For example, two children can use drums, four children can use triangles, four can use the bells, and two can use tambourines. A parade can be worked out in any number of ways.

Arrange on the table or floor in groups of 2 and 4 such objects as marbles, stones, jacks, buttons, etc. Cover the objects with a piece of oaktag or cloth. Remove the cover and direct the children to look for a group of 2 (or 4). Allow them to look for only a few seconds, then replace the cover. Give each child in the group an opportunity to describe a group of 2 (or 4) things that he saw. Rearrange the objects slightly and repeat the activ-

ity. The brighter children should be able to see several groups of 2 (or 4) at one glance.

Prepare for each child a work sheet (duplicated from a master copy) containing three vertical rows of pictures (4 to each row). Each picture is to show 2 or 4 objects. Direct the children to color the pictures according to directions like: "Color blue all the groups of 2 in the row on the left side of the paper." Show them the left row. "Color green all the groups of 4 on the right side," etc.

Put three sheets of oaktag (24" x 36") on the table. Then direct the children either to draw or paste pictures from magazines that show groups of 2 to 4. Give such directions as: "John, put a picture of 4 on the chart at your right. Ann, draw a picture of 2 balls on the middle chart."

Worksheet 14 of *Our Number Workshop 1* can be used with page 14.

15 Two and three

KNOWING YOUR OBJECTIVE FOR PAGE 15

This page acquaints the child with the fact that 2 objects do not always make a pair and that 3 objects may or may not be more suitable in making up a set than 2 objects. This page presents situations requiring judgment of right and wrong with regard to the use of different groups of 2 and 3.

PREPARING FOR PAGE 15

Have available for class inspection objects that are pairs or sets, and others that should be pairs or sets and are not. Prepare for each child a work sheet as described in the activities at the end.

Also if possible have available the books *Come Meet the Clowns* and *Fun with Music* (items 8 and 15 in the bibliography).

INTRODUCING PAGE 15

Read *Come Meet the Clowns* (or tell the story) and sing "Circus Clowns" in *Fun with Music*. Recall with the children the work on the preceding page. Tell them that they will now see a picture of the clowns that Carol, Don, and Nancy saw at the circus. Tell them to find the page in their books. Give them time to hunt the page.

"Do you think the picture is funny? Why? What are the clowns doing? What is funny or wrong about these clowns? Can you find these clowns in the picture on the page at the left? Are they the same clowns? Are there more or fewer clowns on this new page than on the old page?"

USING PAGE 15

Start the work for this page by reviewing a few of the things learned previously. Ask, "How many clowns are in this picture? Are there the same number of clowns on this page as on the other page on the left side of the book? Are there more or fewer clowns on this page? What are the clowns doing? What is wrong or funny about these clowns?"

"What has happened to the clown without a hat? Ann, tell us how many legs were on the stool before the clown sat down. How many are on the stool now?" Explain to the group that it is not hard to sit on a stool that has three legs but that it is hard to sit on one with just two legs. Ask the children why stools usually have three or four legs.

Ask the children where the barefooted clown's socks and shoes are. Ask the group why the clown with the yellow suit is looking so worried. Ask questions to bring out the difference between just two socks and a pair of socks.

"How many socks does the clown in the yellow suit have? What color is each pair of socks? If he is to wear one pair of socks and the clown who is sitting on the stool is to have the other pair of socks, what will he have to do?"

"Who has the barefooted clown's shoes? Are these a *pair* of shoes or just two shoes that look alike?" Let any child who thinks he knows the difference explain it to the group. Undoubtedly the difference between two shoes and a pair of shoes will need to be explained in detail before many of the children will understand what is meant. Perhaps the best way to explain the difference is by using snap boots or strap slippers with buttons.

"Do you think the clown with the black shirt will be able to wear the shoes the clown in the striped suit is holding? Why not?"

"What is the clown in the blue suit doing? Is that the way people usually skate? Would it be hard to skate that way? How many skates does he really need? Which skate should he take off? He needs only the pair of skates to skate correctly. These clowns certainly are having trouble getting the right things together."

APPLYING THE NEW CONCEPTS AND SKILLS

Direct the children to put on the table pairs or sets of objects which they have brought from home. Place before the children a mixed-up collection of

objects, some of which are pairs or sets and some of which are not. Let them take turns picking out sets and pairs. (Suggestions for pairs and threes: gloves, mittens [with patterns on the back], three-leaved clovers, three earrings of a kind instead of two, bookends, colored crayons, etc.)

Provide each child with a work sheet on which

pictures of objects have been drawn. Some groups of objects are pairs or sets, some are not. Direct the child to mark the groups that are pairs or sets. Or pictures of objects may be scattered on the work sheet. Direct the child to "color brown the shoes that belong together," "color blue the gloves that you could wear," etc.

Charting the Course

Numbers are used not only to tell "how many," but also to indicate position in an orderly arrangement of objects. Thus if five objects in a row are counted from one end to the other, objects "one" and "five" are at the ends, object "three" is in the middle, and objects "two" and "four" are between "one" and "three" or "three" and "five" respectively. These "positional meanings" are the same as the usual ordinal concepts but need not be expressed by the words *first*, *second*, *third*, etc. Regardless of the order or direction in which a group of five objects may be counted, "three" is the number of the object in the middle, which is separated from the objects at the ends by one object on each side. If the child is to have a rich understanding of the series of numbers, he must learn such *relationships* among numbered positions. Pages 16-19 and the activities in these lesson notes are devoted to a development of these ideas for the numbers 1 to 5. These pages may also be used to introduce and develop recognition of the number symbols 1, 2, 3, 4, 5.

16 Positional meaning of 1 to 5

KNOWING YOUR OBJECTIVE FOR PAGE 16

The purpose of this page is to teach the children the positional meaning of the numbers 1 to 5 with special emphasis on the numbers 1, 3, and 5.

PREPARING FOR PAGE 16

Have available *The Little Train* (item 24 in bibliography) or other stories about trains.

Provide five markers for each child.

Prepare silhouettes of animals and insert in slits in corks as illustrated on page 97.

Chart 3 of the *Number Readiness Chart* may be used in connection with this page.

INTRODUCING PAGE 16

If the *Number Readiness Chart* is available, use Chart 3 as a preparation for this page. Follow the directions in *Developing Number Readiness*.

Read or tell the story *The Little Train* (or a similar story) to the children. Ask if any of them have been to a fair or park where there are many different kinds of rides. Let them tell about these. Ask the group if any of them have ever ridden on a little train. If any child has had a ride on a miniature train, be sure to let him tell about his experience. Ask the children what they must buy before they can ride on a train. Be sure they realize they must have a ticket to get on a train.

USING PAGE 16

With this picture the children will abandon the use of objects and markers as a means of pairing or matching and will use the number words *one*, *two*, *three*, *four*, and *five*. The child must learn to use these words instead of counters to show a one-to-one correspondence. This is a step beyond what the children have done before, since now the child is saying a different word in a fixed sequence instead of using an object for each counted item.

Show the children page 16 in the book and have them open their books to that page. Tell them that Father, Mother, and the three children are now at the circus. Encourage discussion by such questions as: "What do you think the children in the picture are doing? Why are they buying tickets? Find Don, Carol, and Nancy."

Tell the children that the girl in the yellow dress would like so much to be number one. "Who would be number two then? Who would be three?" Bring out that Carol (the girl with a coin in her hand) is "four," and Don (buying the ticket) is "five." "Would Nancy care whether they start from left or right? Why not?" Let each child have

several turns counting the children in this way. Be sure he points to a child for each word.

Tell the children that the train is ready to start and that, perhaps, some of the children will not be ready to ride. "How many children are waiting? Who should get to the train first?" Now show the children that they should say "one" for Don (buying the ticket) when they count from the right or from the beginning of the line. Carol is "two," Nancy is "three," the boy with the cap is "four," and the girl in yellow is "five." Let each child have several turns counting the children in this way. Be sure he points to a child for each counting word. Pay particular attention to the order of the counting words.

After the children have demonstrated their ability to count the children in both directions, use directions and questions to develop skill in immediately identifying the five children by number from either direction. Responses may be given orally, by pointing to the correct child, or by the use of markers.

Point out to the children that no matter in which direction they count, Nancy (the little girl with the balloon) is always "three," and that there are always two children on each side of her. She is the middle of the group of five.

The "middleness" of *three* in a group of five can be demonstrated as follows. Give each child five markers. Have him put the markers in a line across his desk. Then have him put a finger from each hand on the two outside markers and move them toward him. Then move the next markers forward in the same way. He will then find that there is an

odd marker which is the center marker. If pupils need still more help, give them added practice by using erasers, papers, pencils, crayons, or any other small objects that may be in the room. Then continue the lesson somewhat as follows.

"Now find the child who is in the middle of the line. Who is it? What does she have in her hand?" "Find the child who is 'two' from the front of the line. What is her name? Which child is 'four'?"

Develop the idea that *two* comes after *one*, and that *two* is always between *one* and *three*. Develop *four* as between *three* and *five*.

Give each child the opportunity to identify each position in response to a direction or question containing the number word. Then give him the opportunity to say the correct number words to describe positions he selects.

Finish the page with a statement like: "I imagine these children are anxious to get on the train. Tomorrow we will find out what they do."

APPLYING THE NEW CONCEPTS AND SKILLS

Have the children make a ticket booth by turning an orange crate on one end. Or a desk may be used. Let the children line up in groups of five to buy tickets. The other children can name the child who is number *one* in line, number *two*, etc.

Exercises similar to those just described can be used in connection with the houses, trees, walks, garages, and cars in the picture on pages 6 and 7.

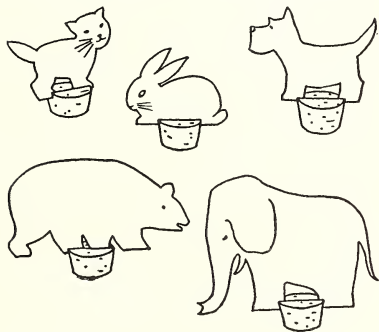
Arrange five chairs in a row. Tell the children to play that the chairs are cars. Then have them respond to such directions as: "Mary, sit in car one from the right. Billy, sit in car number two from the back." Another way to use the chairs is

to have children sit in the five chairs. Then ask such questions as: "Who is sitting in car three, Tom? Who is sitting in car number four from the front, Ann? Henry, who is sitting in car number four from the back?"

Make up "riddles" for the children to guess the answers. Brighter children may be able to make up riddles after hearing several. The following is an example of a simple riddle. "I see a girl who has on a red dress. She has black hair. On which chair is she sitting?"

Cut out silhouettes of different animals and insert them in half corks as shown below. Have the children arrange the animals according to directions. "Put all five on the desk. Put the rabbit number one from the window. Put the bear number two. Put the elephant number five. Let two and five change places. Who is number five now?"

Worksheet 15 of *Our Number Workshop 1* can be used with page 16.



17 Positional meaning of 1 to 5

KNOWING YOUR OBJECTIVE FOR PAGE 17

This page continues to develop the use of number symbols 1 to 5 and provides opportunities for their recognition and meaningful use.

PREPARING FOR PAGE 17

Have on hand items 15 and 20 from the bibliography or a similar song or story about trains.

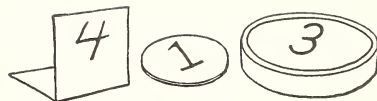
Chart 4 of the *Number Readiness Chart* may be used with this page.

Prepare a set of five markers for each child in the group. Each marker should be labeled with one of the numbers from 1 to 5. An easy way to make these markers is to paste on a checker a gummed parquetry paper on which a number has been written in ink. Square, round, or rectangular pieces of hard, heavy paper make good numbered markers. See the pictures at top right for examples. Be sure that the markers are alike in color, shape, etc., so that the child cannot identify them by such characteristics. Write the numbers on a marker so that there is more space below the number than above it.

Draw an engine and 5 cars or the five cars only on a large chart made of cardboard or paper or on the blackboard.

Have available 7 or 8 sheets of oaktag (24" x 36") to make the "train" described in the concluding activities.

If the activities described at the end of the lesson are to be used, ask children to bring kitchen-sized match boxes, milk-bottle tops, and spools.



Prepare for each child a copy of the work sheet described in the concluding activities.

INTRODUCING PAGE 17

Sing "The Streamlined Train" to the children or have them sing it, or read *I Like Trains* to them. If any of the children know a train song or a story about a train, let them sing the song or tell the story.

Ask the children if they remember what they did the last time they used this book. See if they remember how many children were in the picture on page 16. Now show them page 17 in the book and ask them to find it. Tell the group that some of the children who were buying tickets in the other picture were not able to ride the train this time. Let the group decide which children on page 16 were not in time for the ride and give reasons for their lateness. (The girl in the yellow dress and the boy in the gray shirt.) Let the group look at the picture awhile and talk about it.

USING PAGE 17

Before beginning the work for this page give each child in the group 5 markers numbered from 1 to 5.

First ask the children how many cars are back of the engine. "Do you know the boys who are riding in Car 1 back of the engine? Do you know the children who are riding in Car 5? What is the boy in Car 5 doing? Find the middle car. What

is the number of that car? Who is going to ride in Car 3? Do you know the girl who is riding in Car 2? What color dress does she have on? In what car do you think Don will ride? He was the first one to buy a ticket. Now he is the last one to get on the train. What do you think caused him to be last?"

Now have the children put the markers on their desk with all the numbers turned up. Ask the group what car the two boys are sitting in. Be sure they identify it as Car 1. Show them a marker with the number 1 on it and tell them that it shows the number 1. Then write the number 1 on the first car (from the left) that you have drawn on the blackboard (or on large paper). Tell the children to put the marker with a 1 on it on Car 1 in their book.

"What number do you say for the car that comes after Car 1 and before Car 3? Who is sitting in Car 2?" Next show them a marker with the number 2 on it. Tell the children that this is number 2. Write 2 on Car 2 on the blackboard. Tell the children to put marker 2 on Car 2.

Write the number 3 on the middle car on the blackboard. "This is Car 3 and I have written the number 3 on it. Find Car 3 in your book. Put the marker with a 3 on it on Car 3 in your book."

Ask the children to say the number of the next car. Emphasize its position between Car 3 and Car 5. Write the number 4 on Car 4 on the blackboard. Explain that the number you have written is called "four." Continue as with the other numbers. "Find the marker with 4 on it. Put it on Car 4. What number is on the ticket that Don has

in his hand? Is that why Don is going to ride in Car 4?" After the children have discussed that question for a short time continue with the lesson.

"Where is the last car? What number should I put on that car?" Write 5 on the last car. "Put the marker with 5 on it on the last car."

Be sure that each child in the group has the correct markers on the correct cars. After you have checked the work carefully, continue the lesson somewhat as follows.

"Find the car that is numbered 1. Pick up the marker from that car. Which is the last car? What number is on the last car? Pick up that marker. Find the middle car. What number is on that car? Pick up number 3. Find Car 4. Pick up that marker. What car still has a marker on it? What number is on the marker? Pick up that marker."

"Now put the markers back on the cars again. Be sure you put the marker with the 1 on it on Car 1. Look at the cars on the blackboard for help." Check the work to see if it is right. If the markers have been prepared so that there is more space under the numbers than above them, explain this fact to the children so that they will know when the numbers are right side up.

"Turn over the marker that is on the middle car. What number did you turn over? Now turn over the marker with 2 on it. Can anyone tell us an easy way to find Car 2?" Bring out its position between Car 1 and Car 3. "Find the marker with 4 on it. Turn it over. How can you easily find Car 4? What markers are still on the cars? Turn over the marker that has 1 on it. What is the number of the last car? Turn the marker over."

"Now take all the markers off the cars again. Put them on your desks so that you can see the numbers. Be sure you have the numbers right side up." Check this before proceeding. "I am going to erase the numbers from the cars on the blackboard. See if you can put the correct markers on the cars in your book without looking at the blackboard." Check the work and help those who need it.

After the children can, without help, put the five markers on the correct cars, practice the skill as follows.

"Find the marker with 1 on it. Put it on Car 1. Put the correct marker on Car 5. Put the correct marker on Car 3. What two numbers are left? Put them on the correct cars." Check their work carefully. Give extra help to the children who need it. The slower children will need much additional practice before they will be able to do this work.

On a subsequent day explain to the children that the locomotive can be attached to the other end of the train. Tell them to number the cars from the other end of the train. Direct them to put the marker with 1 on it on the first car at the right. Then go through activities similar to those already described.

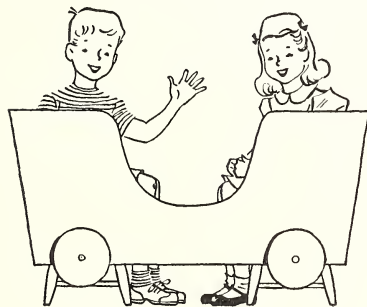
As a general principle, after the children understand that counting may proceed in any direction, stick to the functional direction in all situations. Be sure there is a good reason for counting from the right before requiring the children to count from the right. The position of the locomotive supplies such reason. This principle should be remembered in subsequent lessons.

APPLYING THE NEW CONCEPTS AND SKILLS

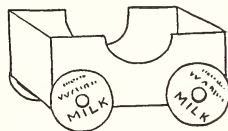
If the *Number Readiness Chart* is available, use Chart 4 as outlined in *Developing Number Readiness*, pages 14-15.

Have the children make a train of oaktag. Use a sheet 24" x 36" for the body of each car, cut to the correct shape. Cut the oaktag so that there are two wheels for each car. Have the children color the cars red and the wheels black. Fasten the cars to two chairs with string as shown in the picture below. An engine can also be cut from oaktag and painted black. Use this "train" as follows: "Ride in car number 5, Mary and John. Tom and Bill, ride in car number 1. Sue and Sally, you may sit in the middle car." Make an engine that can be put at the other end of the train. Then give directions like those already described in this paragraph.

Use small boxes such as large kitchen-sized match boxes to make miniature trains. Wheels can be made of milk-bottle tops and attached to the



boxes with fasteners. See the picture below. Five cars and one engine are all that should be made for each train. Direct the child to put the engine at one end of the train; then give him directions like "Put the red stick in Car 2, point to Car 4, put the marker with 5 on it in Car 5. Now put the engine at the other end of your train." Continue with additional directions.



Miniature trains also can be made by tacking small pieces of oaktag to spools with thumbtacks. The children can color the cars red and the spools black. Fasten the cars together with string. Direct the activities as above.

Provide each child with a work sheet on which there is a picture of a train with five cars. Give such directions as: "Put an X on Car 1. Put a line over Car 5. Put a green circle around Car 3. Color Car 4 red. Color Car 2 black."

Use the train made of large oaktag and fastened to the chairs, as described above. Let each child take the part of a child in the picture. Then direct him to get into the correct car.

With some of these exercises begin the use of the words *first*, *second*, *third*, *fourth*, and *fifth*. At first restrict their use to the abler group of children.

Worksheets 16 and 17 of *Our Number Workshop 1* can be used with page 17.

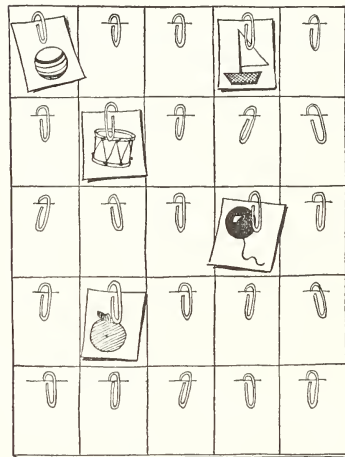
18 Positional meaning of 1 to 5

KNOWING YOUR OBJECTIVE FOR PAGE 18

This page continues the work with the positional meaning of the numbers 1 to 5 and gives special emphasis on locating a position by the use of two numbers indicating direction.

PREPARING FOR PAGE 18

Prepare for the class a chart like the one illustrated below. Use oaktag 36" x 24". Divide it into 25 equal sections and insert a paper clip in a slot at the top of each section. Prepare cards slightly smaller than the squares on the chart. On each card draw or paste a picture of an object that



could be checked (apple, hat, glove, toy, etc.). Prepare sufficient cards so that each child will have one or two.

Prepare the work sheet described in "Applying the New Concepts and Skills" for this page if the exercise described is to be used.

Provide for each child a marker without a number on it and one or two markers, each containing a number (1, 2, 3, 4, 5).

If the "checkroom," described in the concluding activities, is to be used, hunt up 25 small cardboard boxes.

INTRODUCING PAGE 18

Ask the children what they do with their toys when they are through playing with them. Let them talk about the boxes, chests, and shelves they have for their toys. If any child has shelves for his toys, let him tell the other children how many shelves he has and which toys he can put on them.

Explain to the children what a checkroom is and how it is used. If any of the children have had experiences with checking articles, let them tell about them. Be sure they understand the use of the word "check."

Continue by telling the children that the boys and girls who took the train ride had some things they did not want to take on the train with them. Explain that the circus has a place in which to leave things while they ride on the train.

"Open your books to this page." Show them page 18. "These are the things the children checked while they were going to ride on the train." Let the children talk about what they see.

USING PAGE 18

Before beginning the work with this page, explain to the children that each of the places for articles is a box and that they are in rows. Show them what is meant by a row of boxes. Do this by running your finger across the bottom horizontal row. Ask them to show you another row. Let them discover the other rows and point to some boxes in each row.

Next show them the top row. Identify it as the "top row." Now show them the bottom row and identify it as the "bottom row." Ask one child to tell which is the middle row. If he gets confused, show the children the middle row. Before continuing with the work, be sure they understand which is *top*, *bottom*, and *middle*. The children should know *middle* from their previous work with *middle*. Also use the terms *left* and *right* in this work. Identify *left* and *right* positions by some other device if the children do not understand the terms.

The questions and directions that follow give a general idea of how to proceed with the lesson. Responses may be given orally, by pointing, or by the use of a marker. "How many rows of boxes are there in this checkroom? How many boxes are there in each row? Name all the things that you see in the boxes in the top row. Start from the left. If any of the boxes are empty, just say 'empty box.' Let's call the row at the top Row 1 this time."

"Now name all the things you see in the bottom row of boxes. Again start from the left side. What number is this row?"

"Find the middle row. Name all the things you see in that row. What number is this row?"

"Find Row 2 and name the things that are in the boxes in Row 2."

"Row 4 comes between Row 3 and what row? Find the things that are in Row 4. How many things are checked in that row? What are they?"

"Now find Row 3 and tell me what you see in Box 5." Explain to the children that Box 1 is on the left and, if necessary, show them which side is left. "Put your marker on Box 2 in Row 4." Give a variety of such directions.

If there is time, on a subsequent day, continue the work with this page somewhat as follows. "I am going to play that I have checked many things. I will tell you the row and the box and you tell me what I checked in the box. Just for fun we will say that the bottom row is Row 1. Show me Row 5, Row 3, etc." Be sure they react properly to the new starting point and understand it. Continue for a while to work from the left. If the children are confused by the change in direction, show them Row 1 at the bottom and Box 1 at the left. "What did I check in Box 2, Row 5? Did I check anything in Box 4, Row 3? Put your marker in that box."

Before leaving this page, direct the children to locate the boxes from the right side instead of the left side. Be sure to identify the starting point. Follow the same procedures as outlined above.

To keep up the children's interest, let them take turns saying the box and row numbers, while you tell them what things are in the boxes.

To vary the activities, say: "Now I am going to name something I checked. Put your marker on it. I'll ask one of you to tell me which box it is. If I say I checked a football, you will put your

marker on the football. It is in Row 3, Box 5." Be careful to identify the starting point. Give each child a turn.

Ask the children to find an empty box and to be ready to give the row and box numbers. Vary the starting points.

APPLYING THE NEW CONCEPTS AND SKILLS

At this point use the large oaktag chart described earlier in the notes for page 18. Give each child one or two of the small cards on which pictures have been drawn or pasted. Proceed as follows: "Each of these [point to the squares] are boxes. We are going to put some things in the boxes. Call this Row 1 [point to the top or bottom row]. Who has the doll? Put it in Row 1, Box 5 from the left. Will the boy or girl who has the airplane put it in Row 3, Box 1 from the right?" Continue with this type of activity until all the boxes are filled. Then ask such questions as: "Where is the car? Where is the airplane?"

Let the children build a checkroom of boxes fastened together. Paper boxes can be fastened on the bulletin board with thumbtacks or stapled together and stood against the wall. Let the children put little articles in the various boxes. They can take turns acting the part of the man in charge of the checkroom. Give each child in the group a marker with a number on it. Give directions like, "Jim, put the marker in the correct box in row 2."

Give each child a work sheet ruled into twenty-five sections, arranged in five rows of five sections. Give directions like: "Draw a ball in Row 2 from the top, Box 5 from the left. Draw an apple in Row 4 from the bottom, Box 2 from the right."

Worksheet 18 of *Our Number Workshop 1* can be used with page 18.

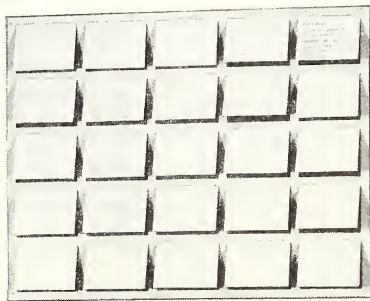
19 Review

KNOWING YOUR OBJECTIVE FOR PAGE 19

This page reviews positional meaning of 1 to 5, recognition of groups of 2, 3, and 4, use of terms indicating relative size and quantity. This page extends the skills developed on page 18 by placing emphasis on counting from the right as well as from the left.

PREPARING FOR PAGE 19

This page can be used to greatest advantage with the "windows" illustrated below. The win-



dows provide a means of concealing all the pictures except the one or two to which attention is directed at the time. They also provide a means of practicing the positional use of 1 to 5. The

windows may be purchased¹ or made from oaktag. The picture on page 103 will serve as an exact model. Use it as a pattern by tracing the lines on transparent paper. If a master copy is made with hectograph ink, copies may be duplicated. Then cut along three sides of each window with a safety razor blade or knife. Provide enough windows so that each child in a group will have one. Use of the windows will add to the teaching value of this page and to the children's interest. The windows may also be used with pages 27, 68, and 69.

If the windows described above are not used, provide each child in a group with at least five markers.

Another substitute for the windows is a single-view frame, similar to the one described on page 86. The opening should be 2 inches by 1½ inches.

Prepare the oaktag chart and work sheets described under "Applying the New Concepts and Skills."

INTRODUCING PAGE 19

It is a good idea before starting the work for page 19 to give a little review of the use of the numbers 1 to 5 to indicate position.

Ask one child to show you the fingers on one hand. Then have the child show you the middle finger. Ask him what number that finger is. Then show the children how to make an X on the blackboard. Have one child make five X's on the blackboard. Show the children how to make a dash on the blackboard. Have another child make

¹ These "windows" may be purchased from Scott, Foresman and Company in packages containing 25 Windows and 25 Frames (see pages 86 and 87).

five dashes on the blackboard. Put a circle around the X that is number 1 in the line. Do this so that the group will know where to start with 1. Have someone make a circle around the X that is number 3. Have another child put a circle around the X that is number 5. Do this with all the X's and then with all the dashes. Be sure the children identify 2 and 4.

Now tell the children that they are going to look at a page that shows toys and playthings that belong to Carol, Don, Nancy, and their friends. Show them page 19 in your book and have them open their books to the same page.

USING PAGE 19

Let the children talk about the toys they see and decide which belong to Don, which belong to Carol, and which belong to Nancy.

These lesson notes are worded for use with the windows but markers or the single-view frame can be used by adapting the directions. If the children need extra practice with this page, use it one day with the windows and another day with the markers or single-view frame.

Show the children the correct way to place the windows over the page. Have them place them over the page so that the edges of the cardboard are even with the corner of the page where the page number appears. The windows should be on in such position that when each window is opened a small picture will be inside each window. Inspect each child's book for this correct position. It may be necessary with an especially clumsy child to fasten the windows in position to the book with a large paper clip or clamp.

The directions and questions outlined below are meant to be suggestive of the type needed to develop the lesson. Care should be taken to change the starting place from top to bottom and from left to right at intervals.

"Find the top row of windows. Let's call this Row 1. Open the window at this side." Show them the side you mean, or say *left side* if the term is understood. "Let's call this Window 1. What do you see in Window 1 in Row 1? Now find Row 2. Open Window 3 in Row 2. What do you see?" Always require a response indicating the number of objects except for the box of toys and the ring with many marbles. Continue with this type of activity until the children can readily open windows as you direct. Follow with similar exercises, using the bottom row as Row 1 and the window on the right as Window 1. Use all combinations of starting places. Markers may be placed on the picture to indicate the response if the windows are not used.

After the children have successfully responded to directions requiring the opening of single windows, give them directions requiring the opening of two windows, as in the following examples. From time to time change the starting place. The following are examples of such exercises (all are given here with the top and left as the starting place).

"Open Window 1 in Row 1. What do you see? Keep it open. With your other hand open Window 5 in Row 5. What do you see? Which doll is bigger, the Indian doll or the cowboy doll? Close both windows."

"Open Window 3 in Row 4. What do you see? [4 bats] Keep the window open. Now open Window 5 in Row 3. Is there a ball for each bat?"

These directions and questions should be used to develop comparisons and ideas like the following: large and small boats; relative sizes of Indian dolls, cowboy and cowgirl dolls, rag dolls, etc.; ribbons and kittens; many and few marbles and toys; largest and smallest blocks, etc.

Several other suggestions follow. Continue to stress the number of objects.

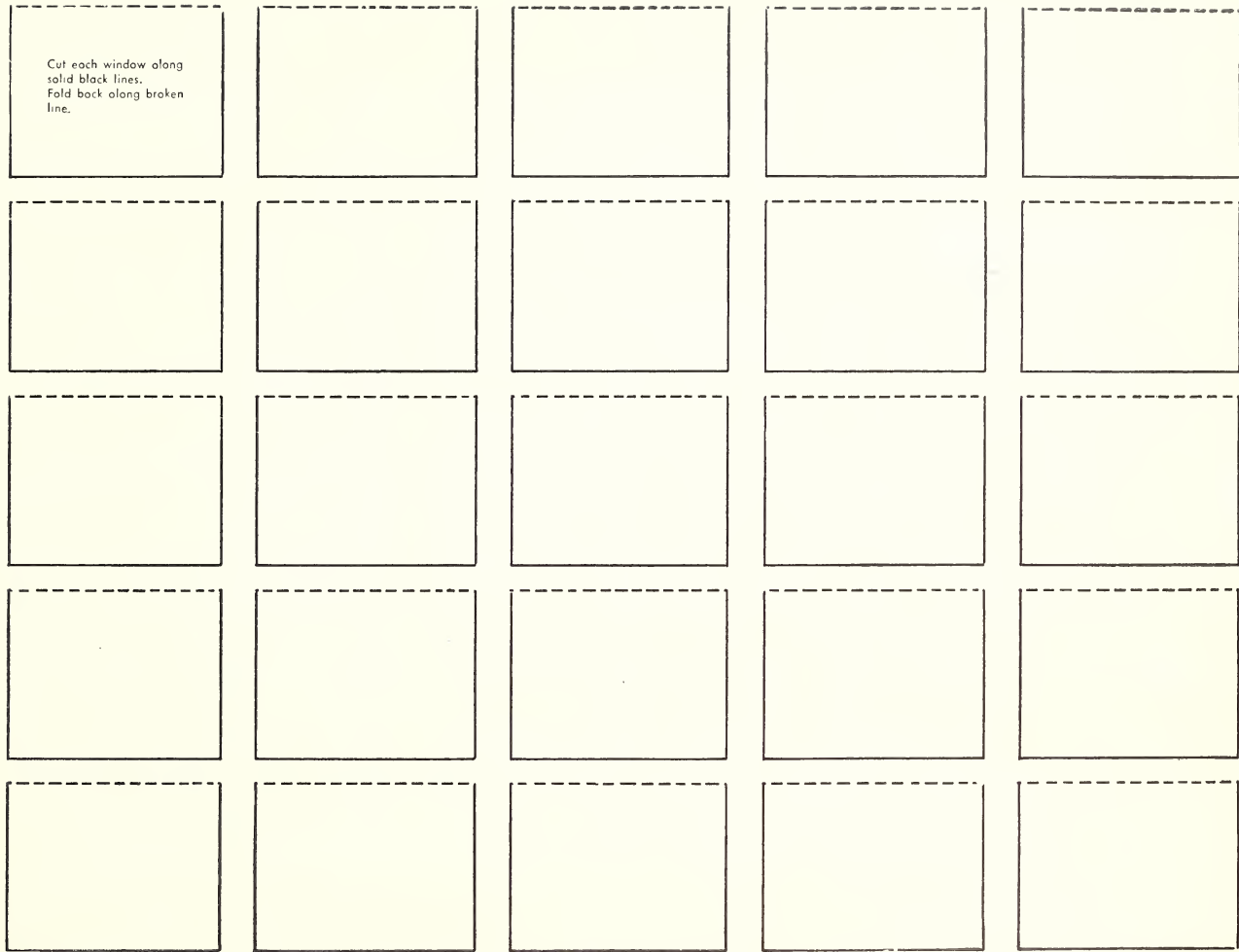
"Find the middle row and open all the windows in that row. Begin at the right and tell us all the things you see in each window. Be sure to tell us the number of the window before you tell us what you see in each window." Let several children tell the various things they see.

"Now, John, you will open the middle window in each row. Begin at the bottom. As you open a window tell us its name. Say 'This is Window 3 in Row 1.' Then tell what you see." Have him open each middle window.

This procedure may be used for the other windows. Let each child in the group have a turn to tell the other children in the group which window to open.

Finally remove the windows. Let the children look at all of the pictures. Ask each child to decide which group of toys he would like most. Tell them they can decide on only the things that are in one picture. Allow sufficient time for the children to make their selection. Then have them tell what they would like by describing the objects, the row, and the picture.

Cut each window along
solid black lines.
Fold back along broken
line.



APPLYING THE NEW CONCEPTS AND SKILLS

Furnish each child with a work sheet ruled into 5 rows of 5 boxes each. Give them such directions as: "Begin at the top on the right. Draw 2 balls in Box 2 in Row 1. Draw 4 boats in Box 3 in Row 5."

Charting the Course

The next step in the readiness program of *Numbers We See* is to enrich the meanings of the numbers from five to ten. The even numbers six, eight, and ten are introduced first by showing some of the simpler sub-groupings associated with them. Each of these numbers can be formed by assembling groups of 2. For example, six can be formed by assembling groups of 2. Six is shown just as the familiar 2, 2 (or 4) and 2 more. Each of these numbers is also shown in an arrangement of two equal sub-groups. Thus eight can be broken up into two 4's or can be formed by combining two 4's. The teacher may, for convenience, think of these operations as *halving* and *doubling*, but these words need not be used in talking with the pupils. Finally, groups represented by even numbers can be distributed by 2's. For example, eight can be separated into four 2's. Development of the ability to see these sub-groups leads to readiness for some of the addition, subtraction, multiplication, and division facts, and helps the child become better acquainted with the numbers six, eight, and ten. Pages 20-23 and the suggested activities in these notes show how these lessons may be conducted.

20 6 as 4, 2; 3, 3; 2, 2, 2

KNOWING YOUR OBJECTIVE FOR PAGE 20

On this page the child learns how 6 is formed by joining a group of 2 to a group of two 2's or 4. He will also learn that 6 can be rearranged into two groups of 3, and that 6 can in turn be formed by combining a group of 3 with another group of 3, and that 6 can be distributed into 3 groups of 2.

Divide a sheet of oaktag (24" x 36") into 5 rows of 5 boxes each. Then direct the children to paste a designated number of parquetry papers in boxes indicated by the directions given.

Worksheet 19 of *Our Number Workshop 1* can be used with page 19.

PREPARING FOR PAGE 20

Each child should have 6 markers.

Provide the materials necessary to make the seesaws described in "Applying the New Concepts and Skills."

Provide copies of the work sheet described at the end of these notes.

If possible, have available items 28 and 37 of the bibliography.

If the *Number Readiness Chart* is available, Chart 12 (top picture) can be used.

If *Arithmetic Readiness Cards Set 1: Grouping¹* is available, Pictures 1-3, 7, 8, 10, 55-57, and 61-65 can be used. Directions for using the cards are given in the *Teacher's Guidebook* included in each set.

INTRODUCING PAGE 20

If any of the children in the group know "See, Saw, Margery Daw" or "See-Saw Sacaradown," let them recite the rhymes.

Promote discussion by such questions as: "How many of you have ever played on a seesaw or a teetertotter? Is it fun to play alone on a seesaw? Why not?"

USING PAGE 20

Be sure that each child has his book open to page 20. Let the children find Carol and Don and talk about the pictures. Then proceed somewhat as follows.

"How many seesaws are in each picture? In the top picture on the left side, how many seesaws are being used? How many children are on each end of the seesaw? How many children in all are on the seesaw? How many more children are coming to play on the seesaw? How many children will be playing on the seesaws after the two girls join the other four children?"

Make very clear that this group of 6 is made up of a group of 2 joining two groups of 2 and also that it is made up of a group of 2 joining a group of 4. Direct the children to put markers on their desks

¹ *Arithmetic Readiness Cards Set 1: Grouping*, by Maurice L. Hartung, Henry Von Engen, and Helen Palmer. Scott, Foresman and Company.

to represent the children on the seesaw. Be sure they arrange their markers in groups of 2. Show them the 4 made up of two groups of 2. Then give them 2 markers to push over to the others to form a group of 6. Be sure that the children recognize this as a group of 6. Let them count the items if necessary. Tell them that when they see three groups of 2 they see 6.

Ask the group if there is any other way that the children could sit so that there are two groups of two on the seesaws. Have them put markers on one of the seesaws in the top left picture to show how the children could sit so that there would be two children at each end of the seesaw.

Now show the children the picture at the upper right. Ask: "How many children are on the seesaws? What is wrong with the way they are on the seesaws? How many children are coming to play with those who are sitting on the seesaws? Where should they sit to make the seesaws work? How many children will be on the seesaws then? Now we see that 6 can also be two groups of 3. Let's play that our markers are children."

Again let them demonstrate on their desks with markers what happened when the three children joined the others on the seesaws. Be sure they see that when a group of 3 is joined by a group of 3 a group of 6 results.

Direct attention to the picture at the lower left and bring out the fact that a group of 6 can be separated into two groups of 3 each. Ask: "What are the children doing now? How is this different from what they are doing in the other pictures? How many children are still sitting on the seesaws?

How many children are going away? How many groups of 3 do you see? If the children were all still playing on the seesaws how many would there be? When 3 of the children go away how many are left? Let's pretend that all the children are still on the seesaws and put a marker on the other end of each seesaw. How many children are on the high ends of the seesaws? How many children in all are on the seesaws? Now move the markers from the high ends of the seesaws to the children who are walking away. How many markers did you move? How many are still on the seesaws? Into how many groups of 3 did you separate the 6 markers?"

If necessary, let the group manipulate the markers on their desks, bringing together two groups of 3 to make 6, then separating the 6 markers into two groups of 3 until you are sure they know that a group of 6 can be made of two groups of 3 and can be separated into two groups of 3.

Next call attention to the picture in the lower right corner. Ask: "What are the children doing now? How many groups of children are there? How many are in each group? How many children are there in all? Put a marker on each child. Now move the markers from each group of two children to a seesaw. Put a child on each end of the seesaws. How many children are on each seesaw? How many seesaws are there? How many children in all are there on the seesaws?" When the children understand that a group of 6 can be made up of three groups of 2, use similar techniques with the picture and the markers to make them see that 6 can be separated into three groups of 2.

APPLYING THE NEW CONCEPTS AND SKILLS

If the *Number Readiness Chart* is used, present the upper picture and follow the procedures outlined for it in *Developing Number Readiness*.

Let the children help make seesaws large enough to accommodate a marker on each end. See the picture below. For each seesaw use one piece of oaktag 2" x 7" and one piece of heavy cardboard 2" x 8". Staple them together so that they form a rocker. Turn up $\frac{1}{4}$ " on each end. Use six checkers or corks as markers. Direct the children to move markers to reinforce the meanings of 6 as described above in this lesson.



Provide each child with at least six markers and three tongue depressors or three pieces of drawing paper shaped like a seesaw board. Proceed as follows. "Put 2 children on one seesaw so they will be able to play. Where did you put them? How many markers do you have left? Put 2 more children on another seesaw so they can play. How many children do you have left now? Put the last 2 children on the last seesaw. How many children do you have left? How many children are on each seesaw? How many children in all are on seesaws? How many groups of 2 are there? Now put 2 children at each end of one seesaw and 1 at each end of the other seesaw. On which seesaw do you have a group of 4? A group of 2? Now put all

the children on one seesaw. What kind of groups do you have now?" Give directions that require separating 6 into two 3's, three 2's, and joining the groups.

Prepare a work sheet for each child with pictures of 6 or more seesaws. Give directions requiring the children to draw children on the seesaws (or X's to represent children) to demonstrate the ideas already discussed.

Make up riddles about the four pictures on page 20. Let the children see if they can find the correct pictures. "The same number of children are on each end of the seesaw. When you put the two groups together you will find that there are 6 children playing. Put a marker on the right picture. How many children are on each end of the seesaw? Each seesaw has a child on it. But they cannot play. They need more children to play. Find the correct picture. Put a marker on it. How many children are on the seesaws? How many more children did they need?"

Worksheets 20 and 21 of *Our Number Workshop 1* can be used with page 20.

21 8 as 4, 4; 8 as 2, 2, 2, 2

KNOWING YOUR OBJECTIVE FOR PAGE 21

On this page the child will discover how 8 is formed by adding a group of 2 to a group of 6. He will also learn that 8 can be rearranged into two groups of 4, and that 8 can in turn be formed by combining a group of 4 with another group of 4, and that 8 can be distributed into four groups of 2.

PREPARING FOR PAGE 21

Chart 13 (top picture) of the *Number Readiness Chart* will be useful.

In addition to those previously listed, Pictures 18-21 and 72-79 from *Arithmetic Readiness Cards Set 1* can be used.

Items 33 and 34 of the bibliography should be available.

Provide 8 markers for each child, 4 of one color or kind and 4 of another.

Prepare a work sheet for each pupil as described in "Applying the New Concepts and Skills."

INTRODUCING PAGE 21

In this picture Carol and some of the others from her group at school are playing some singing games and doing some little dances.

This lesson should be preceded by having the children play several singing games like the following: "Baa, Baa, Black Sheep," "I See You," "Pussy Cat, Pussy Cat," etc. These singing games are useful because they allow the children to act in groups and formations.

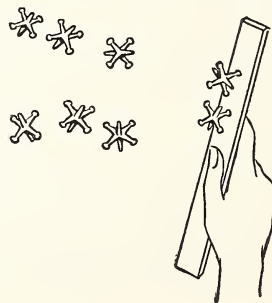
Use the top picture on Chart 13 of the *Number Readiness Chart*, as explained in *Developing Number Readiness*.

Tell the children that they will now see a picture showing Carol and some of her friends playing a game and doing some dances. Then have them open their books to page 21. Show them the page in your book. Ask them what games they think these children are playing.

USING PAGE 21

Begin with the upper-left picture. "What are the children doing? How many children are stand-

ing ready to play the game?" Some children may say 4. If they answer 4, direct their attention to the 2 boys who are waiting for their partners. "How many children are hurrying to their partners? When these 2 girls are ready, how many children will be playing the game?" Tell the children that when there are 6 children ready to play and 2 more join them, there are 8 children in the game. Then continue with activities like those described for the first picture on page 20. After the picture has served its purpose, give each child 4 markers of one kind (or color) and 4 of another (jacks, marbles, sticks, outline figures of boys and girls inserted in corks). Be sure that the children first match their markers with the boys and girls to discover that there is one for each. Each child is to put 6 markers in groups of 2 on his desk. Then he is to move a group of 2 over to the group of 6. See the picture below. This work may be done by having the children themselves move in groups instead of using markers. The children should understand that



8 is formed by joining 2 to 6. Emphasize 6 as 3 groups of 2.

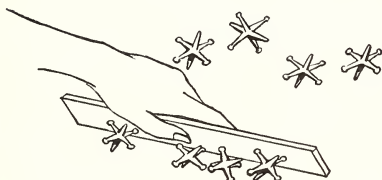
Direct the children's attention to the picture at the upper right. "What game do you think the children are getting ready to play?" If the children in the class have played "Pussy Cat, Pussy Cat" they may recognize this formation. Mention to the children that the girls lined up first and that a group of the same number of boys joined them and stood opposite them. "How many girls lined up to play? How many boys are lined up to play? How many children are playing?"

When the work with the picture is completed, let the children act in groups to form 8 by joining 4 to 4. Finally, direct them to manipulate markers on their desk as suggested by the picture below. They should understand that when a group of 4 is combined with a group of 4, the resulting group is 8.

Direct the children's attention to the next picture and ask what game they think the children are playing. The formation shown is not a very com-

mon one, and the children may not be familiar with it. If necessary, explain that the 4 boys and the 4 girls have been doing a little dance, that they have turned back to back ready to walk away from each other. Emphasize that the 4 boys are leaving the 4 girls. "How many children are playing this game? How many children have their backs to us? How many children are facing us?" Be sure the children realize that the two groups are equal in number.

Conclude the work with this picture by letting the children act out the formations and show by the use of markers that 8 can be separated into two groups of 4. See the picture below.



Direct attention to the last picture. Explain that the children are tired. "What are they going to do? How many children will sit on each bench? Let's see if there are enough benches." Let the children use markers to find out. Direct them to put a marker on each child in the picture. Inspect their work to see that there are two markers on each bench. Be sure that they have markers on the two children already on a bench. Ask such questions as: "How many children are there in all? How

many are on each bench? How many benches are there? How many groups of children are there?" Emphasize the fact that 8 can be arranged into four 2's.

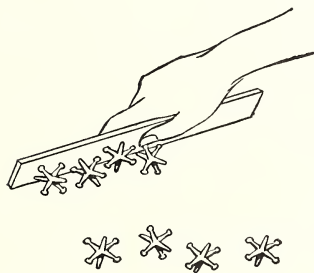
Let the children act out this formation. Then direct them to separate 8 markers into groups of 2 on their desks. Always have them count the total, the number of groups, and the number in each group.

APPLYING THE NEW CONCEPTS AND SKILLS

Make up "riddles" and have the children put markers on the correct picture. "4 boys and 4 girls have joined hands. They are facing each other. Be ready to show me the right picture [or put a marker on the right picture]. Six children are ready to play a game. When 2 other children join them, there will be 8 children ready to play. Show me the right picture."

Give each child a work sheet folded into four equal sections. Direct the children to put 2 X's, one above the other, in the first box. Tell them to pretend that the X's are children. Then tell the children to give each child shown by an X a partner. Have them do this by making 2 more X's close to the others. Now have them make 2 more X's just as they did the first 2. Ask them how many children are now ready to play. "Do they all have partners? How many are without partners?" Tell them to give the children without partners each a partner. "Now find out how many children are playing the game. If we have a group of 6 and bring in a group of 2, how many do we have?"

Give each child in the group 8 markers, 4 red markers and 4 blue ones. Tell the children to



pretend that the blue markers are boys and the red markers are girls. "We will let the children play games. Put 4 boys in one line. Put the 4 girls in front of the boys, one in front of each boy. How many children are playing? Take the 4 girls away. How many children are left? How many twos are there? How many fours are there?"

Worksheets 22 and 23 of *Our Number Workshop 1* can be used with page 21.

22 10 as 5, 5; 10 as 2, 2, 2, 2

KNOWING YOUR OBJECTIVE FOR PAGE 22

On this page the child learns that 10 can be formed by joining a group of 2 to a group of 8, that 10 can be rearranged into two groups of 5, and that 10 can in turn be formed by combining a group of 5 with another group of 5, and that 10 can be distributed into five groups of 2 each.

PREPARING FOR PAGE 22

In addition to those previously listed, Pictures 41-44, 47, and 95-108 from *Arithmetic Readiness Cards Set 1* can be used.

Provide for each child 10 markers, 5 of one color (or shape) and 5 of another color (or shape).

Prepare a work sheet for each child as described in "Applying the New Concepts and Skills."

Have available a sheet of paper (9"x12" or 8½" x 11") for each child.

INTRODUCING PAGE 22

Begin with questions to stimulate discussion. "How many meals do you eat each day? Name them for us. When children go to school all day

and live too far to go home at noon, where do they eat their noon meals?" Let several children have an opportunity to answer that question. Tell them that they will now see a picture that shows how Carol and Don eat lunch at school.

USING PAGE 22

"Open your books to this page. [Show them page 22 in your book.] What time of the day do you think it is? Where do you think these children are eating lunch? Look at the picture at the top on the left. Do you think the children are just beginning to eat their lunches or have they finished? How can you tell? Find Don and Carol."

"How many children are sitting at the table?" Show the children that they are in groups of 2 children each, one opposite the other. "How many groups of 2 are there at the table? How many more children are coming to eat lunch with the 8 children at the table?"

"Is there room for all the children at the table? When the 2 children who are walking toward the table sit down, how many will be sitting at the table?" Emphasize the fact that when a group of 2 joins a group of 8 (four 2's) a group of 10 results. Arrange chairs so that the children perform the activity illustrated. Direct the children to arrange and move markers on their desks to illustrate this forming of 10 (see notes for page 21).

Before leaving this picture, call attention to the two groups of 4 children who are already seated. Ask: "How many will soon be sitting on one side of the table? Will there be the same number on each side of the table?"

Continue with the picture at the top on the right to establish the idea that, when a group of 5 joins a group of 5, a group of 10 results. Point out that the children facing the reader are joining those already seated. Note that this is a different group of children. "How many children are standing behind the table ready to sit down? How many children are walking toward the table? How many children are going to eat at this table? How many groups of 5 are there?" Let the children act out this table seating arrangement and direct them to manipulate markers to illustrate the formation of 10 by groups of 5.

Let the children discover that the next picture shows a new group of children. Use this picture to establish the idea that a group of 10 can be separated into two equal groups of 5. "How many children have been eating at this table? How many children are leaving the table? How many are staying at the table?" Let the children perform this activity and direct them to manipulate markers to illustrate the idea, as explained for 8 in the notes for page 21.

In the last picture on the page let the children discover that these children appeared in the other pictures. "What are the children doing now? How many children are there? How many little tables do you see? How many children can sit at each one of the little tables? Are there enough tables for all of the children? How many groups of 2 are there?" Use this picture to emphasize the fact that 10 can be distributed into five 2's. Let the children play out this activity and then use markers to show how 10 can be distributed.

For the slower children the lesson can be enlarged upon as follows. Always direct the children to count all of the children in the picture after performing as directed. "Put a marker on the picture that shows 5 children sitting at a table and 5 children standing at the same table. Put a marker on the table that has 4 children sitting on each side and 2 more children coming to join them. Find the table that has 5 children sitting on one side and 5 vacant chairs on the other side. Put a marker on it. Find the picture that shows the children sitting in 2's at small tables. Count the tables. How many are there? Put a marker on that picture."

APPLYING THE NEW CONCEPTS AND SKILLS

Provide each child with a piece of paper (9"x12" or 8½"x11") and 10 markers. Tell them to pretend that the paper is a table and that the markers are children. Direct them to put four groups of 2 children each at the table so that there are 4 children on one side of the table and 4 on the other side. Then tell them to have 2 more children join these children. Ask them to tell how many are at the table now. Use this "table" to illustrate the combining of two groups of 5 each and the separation of 10 into two groups of 5.

Provide each child with a work sheet on which pictures of six tables have been drawn. Direct the activities of the group as follows. "Let's make X's and pretend that they are children. Put 4 children on one side of the table at the top of the page. Put 4 children on the other side of the same table. How many children are sitting at the table? If 2 more children came to eat lunch with the children at the table, how many would be sitting at the

table? Use a pencil or crayon of another color. Put 2 more children at the table. Put one on each side. How many groups of 5 are there?" Use other tables to illustrate this and the other concepts being developed.

Worksheets 24 and 25 of *Our Number Workshop 1* can be used with page 22.

23 Groups that make up groups of 6, 8, and 10

KNOWING YOUR OBJECTIVE FOR PAGE 23

On this page the child receives practice in recognizing groups of 6, 8, and 10, in combining equal smaller groups to form groups of 6, 8, and 10, and in separating groups of 6, 8, and 10 into two or more smaller equal groups.

PREPARING FOR PAGE 23

Supply each child with 10 corks (spools, beads, etc.) and 5 sticks (or strings). The corks (or other objects) are to have holes into which the sticks (or strings) can be inserted. The corks should be of two colors or kinds, five of each.

The work will be more interesting and more effective if each child in the group is furnished with a frame. (See pages 86-87.)

Also have on hand *The Little Auto* by Lois Lenski (bibliography item 21).

Prepare the work sheets described at the end of these notes if they are to be used.

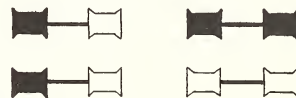
Good use can be made of transparent paper cut to fit the page in the book.

Divide a sheet of oaktag (24" x 36") into 8 equal sections.

INTRODUCING PAGE 23

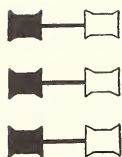
Read the story *The Little Auto* to the children.

If possible, provide each child with 10 objects (beads, corks, spools) that can be connected in pairs by sticks or strings. These objects should be of two colors or kinds, five of each. Give such directions as "Connect a black spool and a white spool. Put them on your desk. How many spools do you have? You have a set of 2 spools. Now make another set like that one. How many spools do you have now? How did you make a group of 4? Can you make these two sets into two other sets?" They should connect a black spool with a black spool.



Continue this type of exercise for the numbers 6, 8, and 10. Form 6, 8, and 10 by combining equal groups of objects (3 with 3, 4 with 4, and 5 with 5). If the children understand the meaning of the word *double*, use it in connection with this work, otherwise avoid its use.

Next review for the children the separation of 4, 6, 8, and 10 into equal groups. Direct them to put 4 corks (or other objects) on their desks. "Now move the corks so that you have two groups that are alike" or "How many corks should you pick up so that there will be the same number on your desk as you have in your hand?" Finally ask a question like: "When 4



is separated into 2 groups that are alike, how many are in each group?"

Continue similarly for groups of 6, 8, and 10. Avoid the use of the words *equal* and *half*.

Ask the children if they can guess this riddle: "I am thinking of a toy that little boys like to play with. It is little and has 4 wheels. It comes in many different colors. Who can tell me what I am thinking about?" If the children have difficulty guessing, recall to them the story of *The Little Auto*.

Tell the children that there is a page in the book with pictures of some toy cars that Don and his friends play with. See that they open their books to page 23.

USING PAGE 23

This page may be used either with the frame or with markers alone. The exercises are described in terms of the frame. See page 88 for information about the use of the frame.

Direct the children to put the frame on the page so that the star is at the top of the page.

"Find a picture that shows 2 cars. What color are the cars? Now find another picture that shows the same number of cars. What color are they? If you could move these two groups of cars together, how many cars would you have?"

"Find a picture that shows 3 cars. What color are the cars? Find another picture that shows the same number of cars. What color are they? If you could move these cars into one picture, how many cars would be in the picture?"

Identify the pictures of 4 cars and 5 cars in this same way.

Now direct the children to put the frame on the page so that the circle is at the bottom. Give directions that require the children to find pictures that show doubles of other pictures.

"Find the picture that shows 2 cars. What color are they? Bob, find a picture that shows two groups of cars like this. What color are these cars? How many cars are there in this picture? Find another picture that shows two groups of 2 cars each. What color are the cars? How many cars are there in this picture?"

Continue in this manner for the pictures of 3 and 4 cars.

Now direct the children to turn the frame so that the star is at the bottom of the page. Here again they can find 2 and its double, 3 and its double, 4 and its double, and 5 and its double. Ask the same type of questions for this position of the frame as you did above.

With the frame in the same position call the children's attention to a picture of 4 cars. Then call their attention to a picture of 2 cars. Let them discover that there is the same number of cars in the picture of 2 cars as there is in one row of cars in the picture of 4 cars.

"Now find a picture of 6 cars. How many cars are in each row? Find a picture that shows

only the same number of cars that are in one of the rows. What color are they?" The children will discover that there are two pictures that show 3 cars. Ask the questions in such a way that they will answer by color and by number of cars. Use the pictures of 8 cars and 10 cars in this same way.

Direct the children to turn the frame again so that the circle is at the bottom of the page. Proceed as described immediately above.

Finally turn the frame so that the circle is at the top of the page and direct the children to find groups that make up 6, 8, and 10 and groups into which 6, 8, and 10 can be separated as described for other sides of the frame.

APPLYING THE NEW CONCEPTS AND SKILLS

Have the children arrange markers on their desks or on a table according to directions given. Such directions should include the ideas reviewed on page 23.

Supply each child with a work sheet on which pictures of objects have been drawn like those in the book. Apples, trees, chairs, etc., can be drawn instead of cars. To avoid clues, use the same object throughout. Give directions requiring the children to color the objects. "Find a picture that shows 2 apples. Color them red. Find a picture that shows two groups of 2 apples. Color those apples red, too."

The same work sheets can be used later to practice separating groups into 2 equal groups. Fasten transparent paper over the work sheets and give directions such as, "Put an X on the picture that shows 4 apples. Look to see how

many apples there are in one row of this picture, but don't tell me. Put a circle on the picture that shows how many apples you found in that one row."

Transparent paper may be placed over page 23 in the book. The paper can be fastened to the page with paper clips or a clamp. The children can make marks over the pictures in response to directions.

Have the children fold paper into 4 squares and draw pictures in the squares according to directions. "Draw 3 balls in the first box. Draw two groups of 3 balls in the next box. Draw

8 stars in the next box. In the last box draw the 8 stars to show how they would look if we separated them into two groups that are equal."

Divide a piece of oaktag (24" x 36") into 8 boxes. Have the children paste parquetry papers in the boxes as directed. "Put 5 circles in the first box. Put two groups of 5 circles in the next box. Put 6 circles in the next box. If we separated these circles into 2 groups that are alike (in number), how many would we have in each group? Put one group in box 4."

Worksheet 26 of *Our Number Workshop 1* can be used with page 23.

Charting the Course

The main difference between the even numbers and the odd numbers is that the latter cannot be broken up into two groups "evenly"—there is always one extra. In becoming well acquainted with *five*, for example, the child should see that it is composed of two groups of two and one more. Similarly, seven is composed of three groups of two and one more, and *nine* is composed of four groups of two and one more. Since *five* presents only one additional combination of component¹ subgroups, namely two and *three*, this combination is shown on the page devoted to the number *five*. The other combinations of component sub-groups of the numbers *seven* and *nine* are introduced later. Even if some of the pupils notice these other combinations of component groups, such as 4, 3 for 7, they should not be stressed at this point. The experiences provided prior to these pages should enable the children to recognize the groups of four, six, and eight which, together with the "one extra," form the odd numbers *five*, *seven*, and *nine*. Pages 24-27 and the following lesson suggestions are planned to emphasize the "one extra" characteristic of the odd numbers.

¹The various pairs of groups which can be combined to form a number or into which a number can be separated will be referred to as the component subgroups of the number. Thus 2 and 5 are com-

ponent subgroups of 7, but 2, 2, and 3 are not. The number itself may be thought of as a "combination" of these component subgroups.

24 5 as 2, 2, 1; 3, 2; 4, 1

KNOWING YOUR OBJECTIVE FOR PAGE 24

On this page the child learns that a group of 5 can be formed by assembling groups of 2 and 1 extra and that a group of 5 can be made up of or broken into the component groups 4 and 1, 2 and 3. He also learns to recognize 5, without counting.

PREPARING FOR PAGE 24

Supply each child with 5 markers.

If possible, have on hand the poem "Hiding" (item 47 in the bibliography).

Prepare the work sheets, fences, and trees described in "Applying the New Concepts and Skills." See picture of fence in corks below.

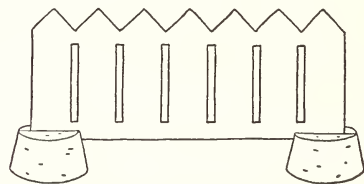
Chart 9 of the *Number Readiness Chart* will be useful.

Pictures 4-6 and 58-60 from *Arithmetic Readiness Cards Set 1* can be used.

INTRODUCING PAGE 24

Recite the poem "Hiding" to the children.

Ask the children if they ever have played "Hide-and-Go-Seek." Let one child tell how the game is played.





The pictures at the left on this page show Catharine Mahoney, one of the authors, teaching page 24 to a group of first-grade children in her school. Note the paper fences and cork markers.

USING PAGE 24

Show the children page 24 in your book and direct them to open their books to the same page. Tell them that Don and some of his friends have met and have decided to play "Hide-and-Go-Seek." One of the boys will have to be "It." Ask, "What do you think the boys are talking about in the first picture? Find 2 boys who seem to be together. Why do you think they are together? Find 2 more boys who are together. What do you think they are doing? Are all the boys in groups of 2? Why not? What do you think the boy who is alone is doing? How many boys are being counted? How many boys are doing the counting? If one boy is going to be 'It,' how many boys will there be left to hide? How many boys in all are in this picture?"

In the next picture (at the top of the page) the boys have decided who is to be "It," and the others are starting to hide. "How many boys are there in this picture? Where are the boys hiding? How many boys are hiding behind the bush? How many are hiding behind the fence? How many boys are playing? How many are not hiding?" Have the children look at the picture and discuss it. Let the children manipulate jacks (or other markers) on their desks to show the groups in which the boys are playing in this picture.

"In the picture at the bottom of the page how many boys are there? How many are running toward the tree? How many boys are still hiding? Do you think that the boy who is 'It' will get to the tree first? What will the boy who gets there first say? If the boy who is 'It' gets there first, what will he say? Which was the best place to hide? On which side of the fence are there more boys? Put a marker on that side of the fence." If the slower children are unable to tell without counting, have them put a marker on each boy hiding behind the fence. Then have them move each marker to a boy on the other side of the fence. In that way they will be able to see that there are not enough markers and, therefore, not as many boys.

Have the children discuss other ways of hiding. Let them show with markers how they would hide or arrange themselves.

"Now let's look at the trees at the right side of the page. Look at the green trees first. How many green trees are in the blue field? Is there a tree here for each boy who is hiding? If we are to have a tree for each of the 5 boys, we need how many more trees? Now look at the trees of other colors in the white fields below. Find the field that has the right number of trees to put with the 4 in the blue field. What color is this tree?" The children may be directed to show the correct field. Be sure that responses are made from the six white fields below.

"Look at the green trees again. Find a field with 3 green trees in it. What color is this field? Show me the field [or "put 3 markers on the

field"]. Which group of boys could hide behind these trees? How many more trees will you need for the other boys in this picture? Find a white field below that has these extra trees in it. Put a marker on it for each tree. What color are these trees? How many trees do you have in all now?" Be sure that the children remove the markers each time you have finished an exercise.

"Mark a field in the top row that has just 1 tree in it. Put a marker on it. What color is this field? How many more trees do you need so that each boy in the first picture will have one? Find a white field below that has these trees in it. Put a marker on this field for each tree you need. What color are these trees?"

Proceed in this manner with the red field.

"Now let's find fields that have enough trees for the boys. Which field has a tree for each of the 5 boys? Put a marker on it for each tree. Find the field that has a tree for each child who is running toward the 'home base.' Find the field with trees in it for the boys behind the fence." Proceed in this manner for the various groups.

"In the top row find a field that has 2 groups of 2 trees in it. Put a marker on each tree in this field. Now find a field with enough trees to use to make this into a group of 5." Give directions requiring the combining of the various groups to make groups of 5.

If at all possible, let the children play the game either in class or at recess time. Divide them into groups of 5 for the game. After the game let them talk about it. Bring into the dis-

cussion references to groups of 2, 3, and 4.

Stress the fact that there are always more in one group than in the other when a group of 5 is broken into two groups.

APPLYING THE NEW CONCEPTS AND SKILLS

If the *Number Readiness Chart* is available, use the activities described for Chart 9 in *Developing Number Readiness*.

Give each child 5 or more markers and a fence. Have them place the markers on their desks according to directions like the following: "Put enough markers on your desk to show the number of boys who were playing 'Hide-and-Go-Seek.' Pick up enough markers to show the number of boys who were hiding behind the fence. How many markers are still on the desk? How many markers do you have in all?"

Prepare for each child a work sheet containing pictures of objects (one kind of object only) arranged in groups of 1, 2, 3, 4, and 5. Give such directions as: "Color the ball in the first picture red. We want 5 balls in all. So find the picture with just enough more balls in it. Color them red also." A large tree may be drawn on oaktag (24" x 36"), showing branches without leaves. Fasten paper clips in various places on the tree (see chart on page 99) to enable the child to put on the tree cutout pictures of birds.

Give each child a large picture of a tree and several markers to represent apples (or birds). Give such directions as: "Put 2 birds high in the tree. Put more low in the tree to make 5 in all."

Worksheet 27 of *Our Number Workshop 1* can be used with page 24.

25 7 as 2, 2, 2, 1; 3, 3, 1; 6, 1

KNOWING YOUR OBJECTIVE FOR PAGE 25

This page establishes 7 as a group formed by assembling groups of 2 and 1 extra and by rearranging into groups of 3 and 1 extra. The child learns to recognize 7 without counting by the inequality of the two groups that make it up. The component groups of 7 (that is, 7 as 5, 2 and 7 as 4, 3) will be developed later.

PREPARING FOR PAGE 25

In addition to those previously listed, Pictures 12, 16, 17, and 66-71 from *Arithmetic Readiness Cards Set 1* can be used.

Have on hand for each child in the group 7 markers, 4 of one color (or shape) and 3 of another.

If possible, have available items 36 and 39 in the bibliography.

Prepare the work sheets and chart described in "Applying the New Concepts and Skills" if they are to be used.

INTRODUCING PAGE 25

A very good story to read to the group is *The Seven Diving Ducks*. This story will make the children aware of the number 7. A story that will create interest in racing is *The Race between the Monkey and the Duck*. Any other stories that will stimulate interest in races and in seven objects will do just as well.

Ask the children what they would use if they were going to haul some dirt, ashes, stones, etc. If no child mentions a wheelbarrow, ask if they have ever seen one or wheeled one. Let the chil-

dren tell about their experiences with wheelbarrows.

USING PAGE 25

Remind the children that 5 boys have been playing "Hide-and-Go-Seek." Then tell them that 2 more boys came to play and that the boys decided to have a wheelbarrow race. "Guess what they used for wheelbarrows! Look at this page [show page 25] to find out."

Let the children talk about the pictures, then see that they discover that there are 7 boys in each picture.

"Look at the first picture where the boys are practicing. How many are in each team? How many teams are there? Why is one boy not in a team? What is he doing?"

Then ask such questions as: "How many boys in all are going to play in teams? When we join the leader with these boys, how many boys are going to play?" Bring out the fact that 7 can be made up of 2, 2, 2, and 1.

"Now look at the middle picture. How do we know that the boys are ready for the race? Why is the boy with the flag standing where he is? How many boys are pretending they are wheelbarrows? How many boys are pushing the wheelbarrows? How many boys are in the race? How many other boys are playing? How many in all are playing?" Establish the fact that 7 can be made up of 3, 3, and 1.

Have the children look at the last picture. Explain to them that the race is over now and they are deciding on the winner and who will be the starter next. Show the children that the boys have

lined up in two rows and that one row has 1 more boy in it than the other. Help them see 3 in one row and 3 in the other row and 1 extra in one row. Be sure they understand that 7 cannot be arranged into two groups that are alike in number.

Now instruct the children to look at the groups of flags at the bottom of the page. Show them the 7 black flags outside the boxes (or fields). Tell the children to find other boxes with 7 flags. Lead them to use the groupings and not to count. Responses can be given by color (white flags in the red box) or indicated by markers placed on the box. Children should explain their selections by such statements as: "I know there are 7 white flags in the red box because there are 3 flags in one row and 1 more than 3 in the other row. I see 2 flags, 2 flags, 2 flags, and 1 flag. I see [in the blue field] 3 flags, 3 flags, and 1 flag."

Ask them how they know that certain boxes are wrong. Bring out such ideas as: "The rows [yellow flags in white box] are alike. Same number in both rows."

"If we wanted to play the game just as the boys in the picture are playing, how many groups of 2 would we need? How many boys would we need as leader? How many would be playing?"

If at all possible, let 7 children in each group have such a race. Have them arrange themselves in groups as shown in the pictures.

APPLYING THE NEW CONCEPTS AND SKILLS

Supply each child with 7 markers, 4 of one color (or shape) and 3 of another color (or shape). Give directions such as "Put enough red markers in a line on your desk to show the number of boys who

were wheelbarrows in the first picture. Put enough blue markers in a line on your desk to show the number of boys who pushed the wheelbarrows. Now put another red marker on your desk for the leader. How many markers in all do you have on your desk?"

Have available for each child in the group a work sheet with many little objects drawn in groups of 5, 6, 7, and 8 made up of the various groupings already taught. Be sure to arrange the groups of 2, 2, 1 and 3, 3, 1 so that not all of the groups are in two uneven rows. Give directions like: "Color red all the groups that show 7 formed by two groups of 3 and 1 extra. Color blue all the groups that show 7 as made up of three groups of 2 and 1 extra."

Prepare a large chart with many groups of objects drawn or pasted on it. Use the same kind of grouping described above. Let the children find the groups of 7 as described by you.

Worksheets 28 and 29 of *Our Number Workshop* 1 can be used with page 25.

26 9 as 2, 2, 2, 2, 1; 4, 4, 1; 8, 1

KNOWING YOUR OBJECTIVE FOR PAGE 26

This page establishes 9 as a group formed by assembling groups of 2 and 1 extra and by rearranging into groups of 4 and 1 extra. The child learns to recognize 9, without counting, by the inequality of the two groups that make it up. The component groups of 9 (that is 9 as 6, 3 and as 5, 4 and 7, 2) will be developed later.

PREPARING FOR PAGE 26

In addition to those previously listed, Pictures 30, 34, 35, 38, and 80-94 from *Arithmetic Readiness Cards Set 1* can be used.

Supply each child with 9 markers, 5 of one color (or shape) and 4 of another.

For one activity ("Applying New Concepts and Skills") it will be necessary to prepare for each child a work sheet with pictures of groups of flags, apples, trees, or animals arranged as described for 7 in the notes for the preceding lesson.

Have on hand a sheet of paper (12" x 18") and about 80 gummed parquetry papers for each child, 40 of one color and 40 of another color.

Procure, if possible, *Fun with Michael* (item 14 in the bibliography) or a similar story to read to the children before beginning the work for this page.

INTRODUCING PAGE 26

Ask the children what kind of race the boys in the picture were having the last time these books were used. Let them discuss the various kinds of races they have been in or have seen. Ask them if the number of people who take part in these races makes any difference. Bring out the need of a leader or starter.

Read *Fun with Michael*, or another story, to stimulate interest in the lesson which follows, if time permits.

USING PAGE 26

Recall with the children that 7 boys have been having wheelbarrow races. Then tell them that 2 more boys have come to play. "Let's open our books to see what they did. What do you think they are doing? How many boys are there in

each picture?" If no one understands the idea of a relay race, explain it to them. Then proceed for each picture in the same manner as described for the three pictures on page 25.

For the first picture bring out the fact that there are 4 groups or teams of 2 boys each, and a leader. Teach that 9 can be made up of 2, 2, 2, 2, and 1.

In the middle picture emphasize the two groups of 4 and the 1 extra boy. Note that one group is ready to take the sticks and that the other group is running. Teach the children that 9 can be made up of 4, 4, and 1.

In the third picture help the children see the unevenness of the two rows of boys. Be sure that they learn that 9 cannot be arranged into two groups that are alike in number.

Now instruct the children to look at the groups of sticks at the bottom of the page. Show them the 9 black sticks outside the boxes. Tell the children to find other boxes with 9 sticks. Try to get them to identify the number by the groupings without counting. Use the same procedures as for the flags on page 25. See the notes for that page.

Be sure to ask them to explain why certain boxes are wrong.

Finally ask: "If we should play this game exactly as these children are playing it, how many groups of 2 would we need? How many others would we need? How many children would be playing?"

If it is at all possible, let the children have a relay race. Have them group themselves as in the pictures.

APPLYING THE NEW CONCEPTS AND SKILLS

Provide each child in the group with a work sheet containing pictures of groups of flags, apples, trees, or animals. Include the various groupings already taught. Be sure to arrange them in pairs and occasionally place the 1 extra so that there are not two uneven rows. Include the groupings: 2, 2, 2, 1; 3, 3, 1; 2, 2, 2, 1; 4, 4, 1. Give oral directions to the children as follows: "Color red the picture [or pictures] that shows 2 groups of 4 and 1 extra. Color blue the picture that shows 4 groups of 2 and 1 extra. Color green the pictures that show 9 in two rows." Check the papers with the children.

Furnish each child with a sheet of paper (12" x 18") and about 80 gummed parquet papers, 40 of one color and 40 of another color. Show the children how to fold the sheets of paper into 4 sections. Give directions somewhat as follows: "Paste 9 red papers in the first box so that they will be in 2 rows. Paste 9 blue papers in the next box so that there will be 4 groups of 2 and 1 extra." Use both sides of the folded papers.

Give each child another work sheet with groups of 1, 2, 3, and 4 objects (all the same objects—balls, or flags, etc.), which can be combined to form 9. Tell the children to "color red 3 groups that form 9, color blue 3 groups that form 9, color green 3 groups that form 9," etc.

Let the children place markers on their desks to make 9, according to oral directions, from groups of 2 and 1 extra and groups of 3.

Worksheets 30 and 31 of *Our Number Worksheet* 1 can be used with page 26.

27

Recognition of 5, 6, 7, 8, 9, and 10

KNOWING YOUR OBJECTIVE FOR PAGE 27

This page provides opportunities for the child to recognize 5, 6, 7, 8, 9, and 10 by groupings previously developed.

PREPARING FOR PAGE 27

Have available to read or recite to the children "Counting Crows," "The Hare," "One, Two, Three, Four," "Spanish Nursery Rhyme," and "Ten Little Indians." These rhymes appear in *Counting Rhymes* (item 9 of the bibliography).

Supply each child in the group with 5 markers of one color and 5 of another color.

Provide each child with a copy of the device called "windows." See the lesson notes for page 19 for information about this device.

Each child may need a sheet of paper (12" x 18" or 8½" x 11") and a sheet of transparent paper.

Supply each child with a work sheet as described in "Applying the New Concepts and Skills."

INTRODUCING PAGE 27

Read or recite to the children the rhymes mentioned above. Read or sing "Ten Little Indians," last. Before reading it, tell the children to put a marker on their desks every time they hear a number. At the end of the rhyme ask how many markers they have on their desks.

Now show them page 27 in the book and have them open their books to that page.

USING PAGE 27

This page may be used with either the windows or markers or both. The same type of directions

may be used for either. Responses can be indicated by opening windows or by putting markers on the pictures. Best results will be secured by using the windows.

Tell the children that these pictures are of objects they have seen before in the book.

Tell the children to look at the top row of pictures. Then ask such questions as the following: "Find a picture in the top row that shows a group of 7. Put a marker on the picture. John, what do you see in that picture?" The marker in this case is used so that the teacher can see if all the children have the right group. Then a specific child can be asked to describe the group. "Now put a marker on all the groups of 7 that you see on the page." After you have been able to check all the children's work, ask them to remove the markers.

Continue in the same manner for groups of 5, 6, 8, 9, and 10.

Another way to do the work for this page is to have the children put the window device over the page. Review the positional use of the numbers 1 to 5 by identifying the top (or bottom) row as Row 1, the next row as Row 2, etc. Also identify the windows on the left (or right) as Window 1 in that row, the next window as Window 2, etc.

When this has been done, give the children directions, like the following: "Elsie, in Row 3 open Window 2. What do you see? John, open Window 5 in Row 2. What do you see?" Be sure the children answer by describing what they see and the number of objects they see. Continue this for all the windows.

The use of this page can be extended by directing the children to open two windows. Then ask such questions as: "Are there apples for each boy [Window 1 Row 2, Window 4 Row 4]? Are there more balloons than kites?"

When the lessons for this page have been finished, have the children look through old magazines and bring to class pictures that show groups of 5, 6, 7, 8, 9, or 10. When the children bring the pictures to class, be sure to put them on large charts. Let the children describe the various groups shown.

APPLYING THE NEW CONCEPTS AND SKILLS

Provide each child in the group with a piece of paper (12" x 18" or 8½" x 11") and show him how to fold the paper into sixteen squares. Then direct the work as follows: "Draw 5 circles in Box 1. Put 7 lines in Box 2. Draw 10 squares in the next box," etc.

Give each child a work sheet containing 25 pictures. Each picture is to show groups of 5, 6, 7, 8, 9, or 10 objects. Tell the children to color blue all the pictures that show 5. Have them color red all the pictures that show 10, etc.

Give the children transparent paper to place over page 27 in the book. Be sure that the papers are securely fastened with paper clips or clamps. Give such directions as: "Put a green X on all the pictures that show 7. Put a red line on all the pictures that show 9. Put a blue circle on all pictures that show 6. Put a yellow X on all pictures that show 5," etc.

Worksheet 32 of *Our Number Workshop 1* can be used with page 27.

Charting the Course

Crude measurement concepts of *tall* and *wide* were introduced in connection with page 10. Pages 28-31, and the activities suggested below, are planned to extend these concepts and develop readiness for the measurement of length. Although at this level of maturity it is not desirable to introduce standard units such as the foot or inch, it is essential to develop the idea that some fixed standard of comparison is necessary. This may be a stick of any convenient length. The objects to be measured may be compared to this length, noting whether they are longer, shorter, or about the same. The next idea is that greater lengths may be measured by using several sticks of the same length (or "standards"), placing them end to end and counting how many are needed. The third idea is that, in place of using several sticks (or examples of the standard unit), one stick can be used repeatedly by moving it end for end and counting the number of times it is used. Finally, in measurement one must be prepared for situations in which the end point of the length being measured falls between one position of the standard and the next position. In this case one may, for example, say the length is "a little more than 4 sticks" or perhaps: "It is a little less than 5 sticks long." These measurement concepts are fundamental and should be well developed before the pupil is taught measurement in terms of yards, feet, or inches.

28 The unit in measurement

KNOWING YOUR OBJECTIVE FOR PAGE 28

In connection with this page the child uses a measurement unit or model once only for each object measured. He measures to find out whether the measured object is longer or shorter than the measuring model.

PREPARING FOR PAGE 28

A little story that can be used to introduce the page is *How Far?* and an appropriate short poem is "Growing Up" (items 18 and 47 of the bibliography).

Have available around the room several sticks of various lengths—yardstick, ruler, window stick, flagpole, branch from a tree, etc.

Also provide each child in the group with a small, colored stick 2 inches long. The stick is to be the same length as the stick the boy in the picture on page 28 is holding.

Prepare a large chart with pictures of sticks and objects of various lengths on it. Some should be exactly 2 inches long, some should be shorter, and some longer. This chart will be used later for practice in measuring.

Prepare for each child a work sheet containing objects and lines. Some should be exactly 2 inches

long, some longer than 2 inches, and some shorter than 2 inches.

INTRODUCING PAGE 28

Read the first six pages of *How Far?* to the children. Do not try to emphasize the reference to the numbers or the inch marks. Use the story only to stimulate interest in objects that can be used to find an approximate size of things that are measured. Read the poem if there is time.

In this lesson no attempt is being made to teach children how to use inches, feet, or any particular recognized unit of measure. The child is merely learning the function of a measuring unit and how to use a measuring device. He will receive experience in the manual and mental activities involved in measuring. He is to use the measuring instrument just once to find whether the object being measured is longer or shorter than the instrument he is using.

Let a child go to the blackboard and stand with his back to the board. Make a mark above his head to show how tall he is. Tell the children that the mark shows how tall John is. Then continue somewhat as follows: "Jane, do you think you are as tall as John? Stand at the board where John's mark is." Now put a mark on the board above Jane's head. Let the children decide whether John is a little taller or a little shorter than Jane. Maybe they are exactly the same size. Let various children compare their heights with John's.

Next have the children in the group open their books to page 28. Explain to the children that this is a picture of Don in his schoolroom, and that he is showing one of the girls in the class a stick ex-

actly the same size as he is. Tell them that he is going to use this stick to find out whether he is as tall as some objects and some other children in the room.

Let one of the children pick out a stick (from the ones provided by you) that is approximately as long as he is tall. Let the children take turns measuring the tops of their desks, the windows, the bookcases, etc., to see if they are longer than, shorter than, higher than, or the same size as the stick.

Now direct the children's attention again to page 28.

USING PAGE 28

After the children have looked at the picture, provide each of them with a stick two inches long. Then proceed as follows: "Do you think the stick Don is holding next to him is longer than he is? Each of you has a stick. Put it right on top of the stick Don is holding. Is your stick as long as the black stick Don is holding? Now let's find other things in the picture to measure to see if they are the same size as the stick Don is holding. Let's all measure the shelf with the sailboat on it. Put your stick right along the shelf. [Show them how.] Marie, what did you find out?" Some children will be a little slower than others to discover that the stick and the shelf are both the same length.

"Now measure the shelf with the train on it. Ann, what did you find out about this shelf?"

"Do you think the stick is longer or shorter than the girl in the picture? Measure her to find out."

Have the children measure the windows between the drapes, the bulletin board, and the doors on the cupboards.



Then direct them to look at the pictures at the bottom of the page. Give such directions as the following: "John, find a stick in the picture that is the same size as the stick you have. What color is this stick? Elsie, find a stick that is shorter than the one you have. What color is it? Now, Marie, find a stick in the picture that is longer than the stick you are using. What color is it? Sam, find another stick that is longer than yours."

Have the children measure the stilts and talk about them. Have them measure all the sticks, the pile of large blocks, the cupboard, the shelves, the rug. Give each child in the group a chance to talk about the pictures he measures.

APPLYING THE NEW CONCEPTS AND SKILLS

Give each child a stick about six inches long. Let him measure several articles in the room to see if they will fit or go into designated places. For example, they can measure books to see if they fit shelves. When a child has measured an object, require him to tell whether it is longer than, shorter

than, or just the same length as the stick.

Use the chart described at the beginning of this lesson. Let the children use the 2-inch sticks to measure the objects to find out if they are longer than, shorter than, or the same length as the stick.

Supply each child with the work sheet previously described. Direct him to color red all the objects that are longer than the stick he has, to color blue all objects shorter than the stick, and to color green all those the same length as the stick.

Worksheet 33 of *Our Number Workshop 1* can be used with page 28.

29 The unit in measurement

KNOWING YOUR OBJECTIVE FOR PAGE 29

The child learns to measure by discovering how many measuring models of the same length equal the length of the object measured. The child learns how to place the models end-to-end in a straight line and to count the number of models.

PREPARING FOR PAGE 29

Have available for each child in the group five sticks, each 2 inches long.

Provide for each child a work sheet containing pictures of objects such as tables, sticks, benches, pictures, cars, etc. Each picture should be exactly 2", 4", 6", or 8" long.

Have available for reading *Amandus Who Was Much Too Big* (item 1 of the bibliography).

INTRODUCING PAGE 29

Read or tell the story *Amandus Who Was Much Too Big*.

Have the children look around the room to see if they can find a place in which to pin up some of the pictures that they have drawn previously. Let several children find suitable places. Pick one picture and ask the children how many pictures of that size will fit in the space they have picked. Some of the children will guess what to do. Encourage all of the children to discuss the possibilities. After several children have suggested possible solutions, continue the lesson somewhat as follows.

"Open your books to this page. [Show them page 29 in your book.] This is a picture of Don and some of his classmates. They are drawing some pictures and want to know how many pictures they can put along the blackboard. How many more pictures do you think will fit across the blackboard? How can you tell?"

USING PAGE 29

Give each child in the group five sticks, each 2 inches long. Tell them that they will use the sticks to find out how many pictures will fit across the blackboard. First let them find out that each stick is the same length as the one Don is using to measure the picture on the easel. Since it is important that the children place the sticks straight across the picture, tell them to put the sticks directly over Don's.

Now tell the children to put a stick on top of each stick that the children in the picture are holding up to the board. It may be necessary to demonstrate this for the children. Examine each child's work to see that he has placed the sticks end-to-end and in a straight line. Tell them to keep the sticks in this position.

"Do you think there will be enough room for the picture that Don has painted? Let's find out. Put another stick on the picture that Don has painted. Now move the stick over to the board to see if it will fit in the space that no one is measuring. Ann, is there room for the picture?" Be sure each child really puts a stick on the board in the correct position to see if Don's picture will fit. Finally ask a question like "Tom, how many pictures will the children need to paint in order to fill the space on the board?"

Call the children's attention to the pictures at the bottom of the page. Explain to them that these are some pictures that Don and his friends have made. Ask the children if they think any of these pictures will fill the whole space across the board. Let them discuss the problem.

Continue somewhat as follows: "How many sticks did you use to measure the blackboard? Then if you wanted to find out which of the pictures at the bottom of the page would fill the whole space, how many sticks long should the picture be? Put your sticks on the pictures below and find the picture that is just the right length."



Watch carefully to see that the children proceed to measure the pictures correctly. Be sure they put sticks end-to-end and in a straight line. Let the first child who discovers the correct picture tell the group. Allow sufficient time so that all the children can measure several pictures.

"Why couldn't you use the row of paper dolls alone to go all the way across the blackboard? How many sticks long is the picture of the row of paper dolls?" "Why wouldn't the picture of the row of houses do? How many sticks long is the picture of the row of houses? What other pictures are too short? Are there any pictures that are too long?"

"Which picture will go all the way across the blackboard, Henry? Jack, find two pictures that can be put together to go all the way across the blackboard. Which two pictures are they? Are there two other pictures that go all the way across? Which pictures are they?" Let the children refer to the pictures by objects on them.

APPLYING THE NEW CONCEPTS AND SKILLS

Show the children how to use sheets of paper as measuring models to find out the number of pictures (of equal size) that they should make to fill a certain space on the blackboard, wall, or bulletin-board. Be sure that the sheets of paper are of the correct length so that a certain number will exactly fit across the various spaces you indicate. For example the children can use sheets of paper 18" x 12" to fit a space 90" long.

Give each child a work sheet as described at the beginning of this lesson. Ask such questions as: "How many sticks long is the car in this picture? How many sticks long is the fence? Color green all the pictures that are 3 sticks long. Color black all the pictures that are 2 sticks long."

Instruct the children to use the sticks to measure various objects in the room to see if they will fit designated places or if they are long enough for

designated purposes. To help them discover the need for measuring devices of the same length, and give practice in manipulating the sticks, let the children select various books of different sizes to use in measuring the tops of their desks, the table, benches, etc.

Worksheet 34 of *Our Number Workshop 1* can be used with page 29.

30 The unit in measurement

KNOWING YOUR OBJECTIVE FOR PAGE 30

The child learns to measure by using the same measuring model repeatedly. He learns the techniques of laying the model in successive positions that are in a straight and continuous line without overlapping. He also learns to keep a record of the number of such positions by counting. The measuring on this page is confined to distances that are exact multiples of the length of the measuring model.

PREPARING FOR PAGE 30

Provide each child with one of the 2-inch sticks used for page 29. Also have available 5 markers for each child in the group.

Prepare for each child a work sheet with six or more vertical lines, each about one-half inch long, drawn at the left. Draw these lines one under the other with about one-half inch space between the ends. These lines should not all be the same distance from the left edge of the paper.

If at all possible, have a Ring Toss game in the room. If not, have available one or two large

spools and some jar rubbers. Make the pegs by putting a stick in each spool. Use the jar rubbers for rings. The children will enjoy making the game.

INTRODUCING PAGE 30

Ask the group if they ever have played Ring Toss. If any child in the group has, let him tell the others how to play. If the game is available, let each child throw a ring or two.

USING PAGE 30

Show the children page 30 in the book. Then tell the group that Don and his playmates have been playing Ring Toss. Tell them that the top picture shows where the peg was yesterday. Ask them to decide where the children stood when they tossed the rings. Arouse the children's curiosity about how to measure the distance they had to throw the rings. Show them how to put a stick between the first two lines. Then show them how to put the stick successively between the other lines. Insist that they count as they lift the stick. It may be necessary to show each child how to do this. Insist on careful placement of the stick. They should conclude that the distance is "4 sticks."

Now direct their attention to the next picture. Explain that the boys are going to play Ring Toss again today and that Don is measuring so that the distance will be the same as it was yesterday. Be sure they understand that he is putting a mark at the end of the stick each time. Ask: "How many times has he moved the stick? Where will he put a mark next? Which ring shows where he should put the peg? Let's measure to find out."

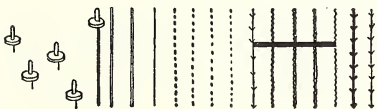
Direct the children to place their sticks in the spaces, and over Don's stick. Be sure they count as

they do this. Then have them put their sticks end-to-end with Don's and decide which ring is 4 sticks from the starting line. Note that the yellow bead indicates the correct distance.

When all of the children can do this, direct their attention to the pegs at the bottom of the page. Proceed somewhat as follows:

"Let's pretend that we are going to play Ring Toss with these pegs. We'll have to decide on which line to stand for each peg." Let the children describe the different lines.

"Let's throw at the green peg first. We'll measure with our sticks so that we will be 3 sticks away from the peg." Show the children how to place their sticks with one end at the black line, how to lift the sticks and place them in the succeeding position, and to count as they proceed. Tell them to be ready to describe the starting line. At first, let the children describe the line that is 1 stick away, the line that is 2 sticks away, etc. Be sure they measure in a straight line and that they gain some insight in placing the stick correctly between the guide lines.



Continue in this manner for each of the other pegs. Variety can be given to the measuring by having the children measure 1, 2, 3, and 4 sticks away for the different pegs.

The work may be concluded by directing the children to measure from a designated line to find the peg that is 1, 2, 3, or 4 sticks away.

APPLYING THE NEW CONCEPTS AND SKILLS

If at all possible, let the children play Ring Toss. If the game is not available, let the children make one as described at the beginning of this lesson. Provide a stick or pole for measuring. This stick should be 3 or 4 feet long. Let the children measure distances from pegs to designated starting lines as in the picture. Let the children make marks or put down markers on the floor as they measure. If a yardstick is used, ignore the markings on it.

Use toothpicks or small sticks to measure various things about the room such as paper, tablets, etc. Be sure that all the things measured can be marked as the measuring is done.

Provide each child with a copy of the work sheet described at the beginning of this lesson. On these work sheets direct the children to measure a distance of 3 sticks from the first line and to put an X at the end of that distance. Give similar directions for each of the other vertical lines.

Worksheets 35 and 36 of *Our Number Workshop 1* can be used with page 30.

31 The unit in measurement

KNOWING YOUR OBJECTIVE FOR PAGE 31

The child continues his experiences in measuring by using the same measuring model repeatedly. He uses the same techniques developed in connection with page 30. The measuring on this page in-

cludes distances that are more than or less than exact multiples of the measuring model.

PREPARING FOR PAGE 31

Have available a stick two inches long for each child, several beanbags, and a foot ruler.

Prepare for each child a work sheet with three vertical lines about one-half inch apart drawn the full width of the paper at the left. At various distances from these lines draw beanbags.

Also prepare for each child a work sheet with one vertical line at the left as described above, and without the beanbags.

INTRODUCING PAGE 31

Begin the lesson by asking the children if they know how to play the game Bean Bag. Let one child give the directions for playing the game. There are several ways of playing the game, and so the suggestions will vary. After a short discussion continue the lesson somewhat as follows:

"Open your books to this page. [Show them page 31 in your book.] How are these children playing the game? In this picture Carol, Don, and two of their friends are playing Bean Bag. They have decided to find out who has thrown the bag farthest. They can see in this picture who threw it farthest but they want to measure to see how far each one threw the bag."

USING PAGE 31

"In the top picture Carol has thrown the beanbag and Don is measuring to see how far she has thrown it. He is using a stick the same size as the stick Jane, the little girl in the blue dress, is using. How many times has Don moved the stick, John? Does the stick touch the beanbag? We say

that Carol threw the beanbag just a little more than 2 sticks away." Let the children measure this distance with their sticks to see that this is correct.

"Now look at Jimmy, the little boy in the blue overalls. What has he done? Jane is measuring to see how far he has thrown the beanbag. She has put a mark on the ground to show where she has placed the stick each time. How many times did she put the stick down? The last time she put the stick down, it went past the beanbag. So we say that Jimmy threw the beanbag just a little less than 4 sticks away." Again have the children take the sticks they have and put them between the marks to see that this is correct. "Did Jane need to put the stick down 4 times? Why did she put it down only 4 times? Could Jane see before putting down the stick for the last time that it was just a little less than 4 times?"

"Now let's look at the picture at the bottom of the page. The colored blocks at the left side of the page show where the children stood when they threw the beanbags. Look at the red block. Measure with your stick from that block to the red beanbag. Be sure to notice the line your stick touches each time before you pick the stick up. Then you will know where to put the stick down the next time. About how many sticks away from the red block is the red beanbag?" If the children

have trouble explaining how far away the beanbag is, help them for the first few times. Encourage them to say "a little more than" or "a little less than" throughout this work.

Supervise the work closely enough to see that the children develop good habits of placing the sticks end-to-end in straight lines and of counting as they work. Try to develop judgment about whether a distance is "less than" or "more than" a whole unit.

"Now look at the blue block. Measure from the blue block to the blue beanbag to see how many sticks away it is. Elsie, how far away is the blue beanbag? Do you need to move the stick again to tell?" The answer to this question involves judgment between the "little less than 5 or a little more than 4" situations.

Continue with the other beanbags in this way.

APPLYING THE NEW CONCEPTS AND SKILLS

Let the children take turns throwing beanbags. Explain to the group how hard it would be to measure the distances with small sticks and develop the idea that a larger stick should be used. Let them try measuring with sticks of various lengths. Always have one child measure with a stick, then let another child do the same measuring with the same stick. Discuss the differences. Also explain that they must all use the same length stick if they are to be able to compare the distances that they threw their beanbags. Let different children measure distances resulting from throwing the beanbags.

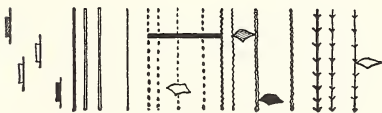
Give each child a work sheet containing the starting lines and beanbags pictured on it, as de-

scribed at the beginning. Direct them to measure with the 2-inch sticks the distance from the first starting line to the beanbag at the top of the page. Instruct them to put marks on the paper as they measure. Let them describe the distance in terms of the number of times they put the stick down. Insist upon the use of "a little more than" and "a little less than." Try to develop some judgment as to when a distance is "a little more than 4" and "a little less than 5."

Give each child the other work sheet, which shows only the vertical lines or starting lines. Give them such directions as: "Draw a red beanbag a little more than 2 sticks away. Draw a green beanbag a little more than 3 sticks away. Draw a blue beanbag so that it is between 3 and 4 sticks away. Draw a black beanbag so that it is a little less than 4 sticks away."

Help the children to measure their heights. Let a child stand against the blackboard or against a paper fastened to the wall. Put a mark at the top of his head. Then give him a foot ruler. Show him how to find his height in terms of this ruler. Let the children take turns doing this. Do not require the children to use the inch marks on the rulers. Let them use such expressions as "almost 5 rulers," "a little more than 4 rulers," "in the middle between 4 rulers and 5 rulers." The teacher may decide to introduce the term *foot*. In this case, the child should understand that everybody uses rulers of the same length. Tell him that it is called a foot because it is about the length of a man's foot.

Worksheet 37 of *Our Number Workshop 1* can be used with page 31.



Charting the Course

Positional meanings, introduced for the numbers *one to five* on pages 16-19, should be extended to include the numbers *six to ten*. The child should become familiar with the use of these numbers in their ordinal function (not necessarily in the form of *first, second, etc.*), as, for example, in the sentence "He is number six in the row." He should learn some of the positional relationships among the numbers of this group, and also their relationships to numbers with corresponding positions in the series *one to five*. Thus *eight* is the middle number of the series *six to ten*, just as *three* is the middle number in the series *one to five*. The number symbols 6, 7, 8, 9, and 10 may be introduced at this time. Pages 32-34, and the suggested activities for them outlined below, are designed to help teachers develop these positional meanings. At the same time, they provide an opportunity to explore and develop the children's understanding of words indicating relative position, such as *left, right, front, and back*.

32 Positional meaning of 6 to 10

KNOWING YOUR OBJECTIVE FOR PAGE 32

Page 32 was designed to teach the child how to identify without counting the positions indicated by the numbers 6, 7, 8, 9, and 10 in a series of 10 objects. This page also introduces the number symbols 6 to 10.

PREPARING FOR PAGE 32

Provide for each child 8 markers of one color or size and 2 of another color or size. Also provide for each child a set of 10 markers with the numbers 1 to 10 on them. For a description of how to make these numbered markers see page 97 of this *Guidebook*.

Prepare for each child a work sheet with several rows of objects. Each row should contain 10 objects, such as trees, flowers, houses, fruit, etc.

Have at hand enough transparent paper to supply each child with a piece 10 inches by 7 $\frac{3}{4}$ inches.

The poem "The Pet Show" from *The Magic Stairway* (item 25 of the bibliography) is a good one to read to the group.

If the *Number Readiness Chart* is available, Chart 5 and Chart 10 may be used in connection with this page.

INTRODUCING PAGE 32

Read "The Pet Show" or some such poem or story about pet shows to the group. Encourage the group to talk about pets they have at home. Find out how many have dogs. Let them talk about their dogs and what tricks the dogs can do.

Open your book to page 32 and have the children do likewise. Tell them that this is a pet show at the school where Don and Carol go. Tell the group that all the dogs are sitting up on boxes so

that the audience can look them over and decide which dog will win the first prize.

USING PAGE 32

The main purpose of the first row of pictures is first to establish the ability to identify positions number 6 and number 10 in a series of 10 without counting. For this reason the big dogs are put in those two positions. Direct the children's attention to the top row of dogs somewhat as follows.

"Ann, can you tell just by looking at the top row how many little dogs there are in the first group of dogs? Start from the left side of the page." Show the children the left side of the page to be sure they start at the correct end. "John, how many dogs are in the last group in the top row? If there are 5 dogs in the first group, the big white dog with the black spots would be what number? Everyone put a marker on the box Spotty is sitting on so that you will remember that he is number 6 in the top row."

"Now which dog is number 10 in the top row? Is he a big dog or a little dog? Let's call him Prince. And remember that he is number 10. Put a marker on the box on which Prince is sitting. What number is Spotty, Ann? What number is Prince, Dick?" At this point arrange 10 objects (such as dolls) in a row. Then ask: "Which doll is number 6? How do you know that this doll is number 6?" The child should reveal by his answer that he knows because it has the same place as Spotty in the row of dogs. The idea is to work for this generalization.

"In the middle row of dogs how many dogs are in the group on the left side of the page? What

dog is in the middle of that group? What number is Spotty? Where is Prince? What number is he? There is another way to tell where Prince is. He is in the middle of the last group. The middle of the last group of 5 is always 8." Make clear that number 3 is in the same position in the first group of 5 as 8 is in the second group of 5. Use the middle picture for this. "Now very quickly put a marker on the dog that is number 3 and on the dog that is number 8. On which dogs did you put the markers?"

"In the middle row find the dog that was number 8 in the top row. What number is he now? Find the dog that was number 3 in the top row. What number is he in the middle row?"

"Now let's look at the last row. Where are Spotty and Prince now? What number is Spotty in this row? If Spotty is just after number 6, what will be his number? Number 8 is the middle of the last group of 5 and Prince is on the box right after 8. What number is Prince? What dog is number 8 in this row, now?"

"What dog is number 7 in the middle row? What number is he in the last row? Put markers on the dogs that are numbers 7 and 9 in the bottom row."

"What is an easy way to remember where 7 and 9 are?" If none of the children is able to explain that 7 is the one after 6 and the one before 8 and that 9 is the one after 8 and the one before 10, explain it to the group.

The preceding work is the most that should be done on one day. On the second day the lesson could be continued somewhat as follows:

"Let's pretend that the blue markers are for the dog that wins the first prize and the red markers are for the dog that wins second prize. In the top row let's have dog number 6 win the first prize. Put a blue marker on the dog that is number 6 in the top row. Be sure you start from the left side of the page. What is the name of that dog?"

"Let's have dog number 10 win the second prize. Put a red marker on him. What is the name of the dog that is number 10?"

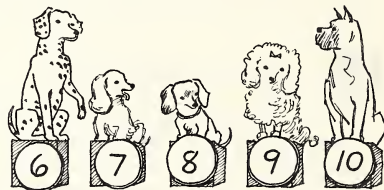
"Let's give all the dogs that didn't win a prize an orange marker. As you put an orange marker on each of the other dogs tell us what number each dog is." Inspect each child's book to see that he has placed his markers correctly.

"In the middle row have the two prize dogs moved? What number is the dog that won the first prize now? Put a blue marker on the dog that is number 3. What dog received the second prize? What number is he now? Put a red marker on the dog that is number 8. Pick up all the orange markers from the top row and put them on the dogs that do not have markers in the middle row. Count again as you put the markers down on each dog."

"Now let's look at the last row. Our prize dogs have moved again. What number is the dog that won first prize? Put a blue marker on the first-prize dog. What number is he now? What number is the dog that won second prize? Put a red marker on him. Now pick up the orange markers from the middle row and put them on the right dogs in the last row. Tell me the number of each dog as you put down each marker."

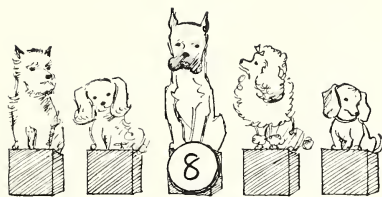
As a quick review have the children give the numbers of the prize-winning dogs in the top row, then in the middle row, and finally the bottom row.

At this point give the pupils the markers that have numbers on them. Have the children arrange the markers on their desks in the same way as you write them on the blackboard. Write the numbers 1 to 10 in a horizontal row on the blackboard. Leave a larger space between 5 and 6 than between any other two numbers. Point to each number and tell the pupils what number it is. Pay special attention to the numbers 6 through 10, which are new.



"Now let's give our two prize dogs their numbers in the top row. What number will you put on Spotty? What number will you put on Prince? Put the number 6 on Spotty and the number 10 on Prince. Now give each of the other dogs in the top row a number. Be sure to start with the little dog on the left side of the page. Put number 1 on his box." Show the children which dog is number 1 on the left.

"What number will you put on the next dog?" Encourage the children not to look at the numbers on the blackboard unless it is necessary. When



they are all through placing the numbers on the boxes, let them look at the blackboard to see if they have them in the correct places. Examine the work of each child.

Continue with the same procedure for the other two rows. Provide additional activities of the kind outlined earlier until the children can identify and properly place the numbers.

APPLYING THE NEW CONCEPTS AND SKILLS

If the *Number Readiness Chart* is available, use Charts 5 and 10. See *Developing Number Readiness* for instructions.

Supply each child with 8 small sticks or markers and 2 larger markers, or 8 markers of one color and 2 of a different color. Have the children arrange the markers or sticks according to such directions as: "Put 5 little sticks in a row across your desk. Now put another 5 sticks in the row to make 10 sticks in all. Be sure that stick number 6 is larger than sticks number 1, 2, 3, 4, and 5 and that the last stick is larger than all the other sticks but 6. What number is the last stick?" This activity can be varied by telling the children to put the 2 large sticks in different positions, especially 5 and 8, 2 and 4, 7 and 9, etc.

Have the children put 10 chairs in a row. Be sure they leave a larger space between chairs 5 and 6 than between the others. Have one child put books on chairs 1, 2, 3, 4, 5, 6, 7, 9, and 10 and let chair 8 go empty. After these books have been removed, have another child put books on chairs 1, 2, 3, 4, 5, 6, 8, and 10 and let chairs 7 and 9 go empty. Continue these activities of putting the books on various specified chairs each time and letting the other chairs go empty.

Distribute to each child in the group a work sheet, described at the beginning of this lesson. Have the children mark or color in the first row the objects that are number 6 and number 10. Then have them mark in some way the objects that are numbers 3 and 8. Let them mark the objects that should be numbers 7 and 9, etc. Have them use different colored crayons each time. The same procedure can be used for all the numbers and for all the rows of pictures.

Instruct the children to put a transparent paper over the page in the book. They can then mark the dogs according to directions.

Let the children pretend that they are the dogs. Give each of the ten children a card with a number on it. Have each child go to his correct chair and sit down. They can be asked by number to perform various acts such as "Dog number 6, bark for us. Dog number 10, stand up." One child might be asked to change places with dog number 3, etc. Another child might be asked to give the dogs the correct numbers after they have changed places.

Worksheets 38, 39, and 40 of *Our Number Workshop 1* can be used with page 32.

33 Positional meaning of 6 to 10

KNOWING YOUR OBJECTIVE FOR PAGE 33

This page continues to develop the positional meaning of the numbers 6 to 10 and gives special emphasis on locating a position by the use of numbers in two directions. The child begins to use the ordinal names for the numbers 1 to 5.

PREPARING FOR PAGE 33

Each child should have the set of 10 markers (to represent tickets), numbered from 1 to 10. Provide each child with a set of colored crayons.

Prepare for each child a work sheet ruled into 10 rows of 10 sections each. Draw a very heavy vertical line to separate the vertical rows 5 and 6.

Prepare a chart of oaktag (24" x 36") divided into 10 rows of 10 sections each as explained above for the work sheets. Be sure to separate the boxes vertically by a heavy line so that 5 are on the left and 5 are on the right in each row.

Have available a supply of gummed parquetry papers.

If the *Number Readiness Chart* is available, Chart 11 may be used with this page.

INTRODUCING PAGE 33

Tell the children to open their books to page 33. Show them the page so they will know what to look for. Tell them that these are some of the people who came to see the dog show.

Ask the group such questions as the following: "Do you think there are many people at the dog show? Do you suppose that these people are rather early and that more people will come a little later? Where do you think the stage is located?"

USING PAGE 33

Call the children's attention to the narrow middle aisle. Let them discover that there are 5 chairs in each row on each side of that aisle.

Ask the children to put up their right hands. Tell them that the side of their book that is on the same side as their right hand is the right side of the book. Another way for them to find the right side of this page is to look in the corner at the color block with the page number. It is on the right side of the page.

"How many children are sitting on the right side of the middle aisle? Put a ticket [marker] on the child. How many men are sitting on the right side of the middle aisle? Put a ticket on each man who is sitting on the right side. How many women are sitting on the right side of the middle aisle? Put a ticket on each woman." Have the children remove all the markers at this point.

Point out that if this is the right side of the page, the other side must be the left side of the page. "How many children are sitting on the left side of the middle aisle?" Continue with the same type of questions for this side as you did for the right side of the page.

Locate the front row for the children. Tell them to call it Row 1. Let them describe the persons in that row. Then direct them to arrange the counters (1 to 10) on the chairs in that row, beginning from the left. Ask such questions as: "Who is in Chair 2? What chair is the woman with the green dress sitting on?" Finally get the children to give such statements as, "The little boy is in Row 1 Chair 8." This type of activity will acquaint the children with

the ideas needed to respond to the work that follows.

Now direct attention to Row 2. "Put the correct ticket on the woman in Row 2." See that they use the marker with 7 on it. Teach them to describe the position by saying "Row 2 Chair 7." Proceed in this way with each row.

Give the children such directions as: "Find Row 5 Chair 6. Who is in that chair? Put the correct [6] ticket on that chair. Find Row 6 Chair 3. Is there anyone in that chair? Put the correct ticket on it." Continue until the children have a reasonable skill in locating these positions.

The children should learn to accept a row of chairs on one side of the center aisle as 5. The objective is to have them find the designated chair in a row without counting.

The work with this page should be done on several different days. Several additional activities are suggested below.

Later, perhaps on a subsequent day, give directions that require locating the designated chairs from the back and right instead of from the front and left.

To teach the children the meaning of *near* and *far*, ask questions like the following: "If you wanted to be very near the stage, in what row would you sit? If you wanted to be far from the stage, in what row would you want to sit? Which row is nearer the stage, Row 2 or Row 10? Which row is farther from the stage, Row 8 or Row 1? Which child is nearer the stage, the little girl or the little boy? Who is farther from the stage, the bald-headed man or the fat man in the blue suit? Find a woman

who is far from the stage. In what row is she sitting? Find a woman who is near the stage. In what row is she sitting?"

In one of the periods devoted to this page begin by telling the children that they are going to help the people find their chairs. Then review *left* and *right*, the row numbers, the number of chairs in each row, *middle aisle*, etc. Be sure each child in the group has 10 markers with the numbers from 1 to 10 on them.

Give directions like the following: "Let's pretend that our markers are people. John, find who holds the ticket with a 6 on it. [The child should select the marker with 6 on it.] Put him in Row 1 from the front. Be sure to put him in Chair 6 from the left. Helen, put the lady who has ticket number 3 in Chair 3 in one of the rows. What row did you put her in?" Check each response.

Before leaving this page, teach the children to say *first* for number 1, *second* for number 2, *third* for number 3, *fourth* for number 4, and *fifth* for number 5. Do not overstress these terms, but encourage their natural use.

Another way to do the above lesson is to give the children two sets of markers or counters with the numbers 1 to 10 on them. One set might be red and one set blue. The child can put the blue markers beside the correct row, according to the teacher's directions, and then put a red counter on a certain seat in that row according to directions.

APPLYING THE NEW CONCEPTS AND SKILLS

Supply each child in the group with a work sheet containing the 10 rows of 10 sections each, as previously described. Give directions like the follow-

ing: "I am going to tell you to draw some pictures in the boxes. Look at Row 1 at the top. How many boxes are there? How many are on each side of the heavy black line? Find Box 7 from the left in Row 1. Draw a red ball in that box. Draw a green tree in Row 4 Box 9. Put a blue X in Row 8 Box 6." Give them enough directions to include a box in each row. Use all positions (1 to 10).

Put the oaktag chart (24" x 36"), divided into 10 rows of 10 boxes, before the children. Give them directions requiring them to paste gummed parquetry papers or to color with crayons in designated boxes.

Have the children arrange 10 chairs in one row. Be sure that a wide space is left between chairs 5 and 6. Have the children sit in the chairs designated, starting both from the left and the right. Later arrange the chairs as the first chairs in 10 rows. Have the children sit in the designated row. Direct them to find the rows from the front and then the back. Give directions requiring them to sit in rows near the front and far from the front, nearer the front than some child who is already seated, etc.

If your school has a multi-purpose room or small auditorium, the class could be taken there to act out directions. The room should be set up with 100 chairs (10 rows of 10 each) or a section of 100 seats should be marked off with strings.

Use Chart 11 of the *Number Readiness Chart* to give additional practice. See directions in *Developing Number Readiness*.

Worksheet 41 of *Our Number Workshop 1* can be used with page 33.

34 Review

KNOWING YOUR OBJECTIVE FOR PAGE 34

This page gives an opportunity to review the positional meaning of the numbers 1 to 10, measurement, and simple pairing.

PREPARING FOR PAGE 34

Have available for each child in the group 10 markers numbered from 1 to 10.

Chart 2 of the *Number Readiness Chart* may be used with this page.

INTRODUCING PAGE 34

Let one child in the group arrange enough little chairs for his group. Show him how to do this by matching children to chairs, "A chair for Sally, a chair for John," etc.

USING PAGE 34

Show the children in the group page 34 in your book and have them open their books to that page.

Ask the children to count the chairs at the top of the page. Tell them to put their markers on the chairs in the correct order. Inspect the books to see that all have done this. Then have them remove the markers. Draw attention to the white chair. Explain that it begins the second group of 5.

Describe chairs by color and tell the children to put the correct markers on them. For example: "Find the black chair with the red seat. Think what number it is from the left. Put on it the marker that tells what number it is."

Mention the chairs by number—"the fifth chair," "Chair 7," "the third chair," etc. (Do not use the ordinal words beyond *fifth*.) Request the children to describe the chair or to put a marker on it. For

each chair mentioned tell whether you are starting from the left or right. Continue in this way until all of the children have had a few turns and all the chairs have been described.

To give practice in simple pairing direct the children to put a marker on each girl doll, then move the markers to the chairs to discover whether there are enough chairs. Encourage them to respond by such statements as "enough chairs for the girl dolls," "too many chairs," "more chairs than dolls," "more dolls than chairs," etc. The children can use the numbered markers turned over so the numbers do not show. Do the same thing with the boy dolls.

Have the children describe which doll is first, last, second, third, number 6, etc., starting from the left and from the right.

After you are sure all the children understand the number symbols from 1 to 10 and the positional meaning of those numbers, and after you feel they can do the simple pairing sufficiently well, continue with the work for the bottom of the page.

Tell the children to look at the picture at the bottom of the page. Discuss the activities that are going on in that picture. Ask them what Carol is doing. Ask if they ever have been measured that way. "Can Carol tell how tall Don is? Can she find out if the other boy is taller than Don by measuring him against the post, too? Who is the tallest child in the picture? Who is the shortest child in the picture? Which child is about as tall as Don?"

Discuss the sizes of the scooters. Encourage the use of such expressions as "just as long as," "larger," "same size as," "tallest," "shortest," etc.

APPLYING THE NEW CONCEPTS AND SKILLS

Chart 2 of the *Number Readiness Chart* will be useful at this point. See *Developing Number Readiness* for the procedures.

Arrange 10 chairs in a row from left to right. Give such directions as: "Nancy, sit in Chair 1 from the left. Bob, sit in Chair 10 from the right."

Charting the Course

The idea of grouping things by twos, which was introduced in connection with the even numbers 6, 8, and 10 on pages 20-23, is taken up again on pages 35-39. These pages help to establish not only readiness for counting by twos, but also readiness for learning some of the related addition, subtraction, multiplication, and division facts. The attention of the children is first focused upon grouping objects by twos—as when one buggy is used to accommodate two dolls. In technical language, this is making a one-to-two correspondence. Following this, six is shown first as built up from three twos, then as rearranged as a four and a two. In the same way, *eight* is shown as built up from four twos, then as rearranged as a six and a two, and finally as two fours. *Ten* is shown as built up from five twos, then as rearranged as four twos (or eight) and two more, and last as three twos (or six) and four more. Thus the meanings of these numbers are further enriched by showing ways in which their subgroups can be combined into larger groups or multiples of two.

35 One-to-two correspondence

KNOWING YOUR OBJECTIVE FOR PAGE 35

On this page the child learns to distribute or match one object to two objects; that is, to match one thing to two things.

PREPARING FOR PAGE 35

Supply each child with 6 or 7 large markers and 12 or 14 small markers.

Provide the children with transparent paper which they can place over the page in the book. The paper can be fastened to the page with paper clips or a clamp. Have the children mark the chairs and dolls according to your directions.

Worksheets 42, 43, and 44 of *Our Number Workshop 1* can be used with page 34.

Have available several containers, boxes, bags, cans, envelopes, jars, etc., and a quantity of objects to put in pairs in the containers.

Prepare for each child a work sheet showing groups of pictures (6 balls, 8 tops, 4 houses, 2 drums, 10 apples, etc.). In each group draw an even number of objects.

Prepare for each child a work sheet divided into four sections. In one section draw 2 flower pots; in another, 3 nests; in a third, 4 dishes; in the fourth,

5 cages. Similar receptacles may be drawn on the reverse side.

Prepare a chart (on oaktag) containing a picture of an apple tree with 5 large branches but no fruit. Have a supply of gummed parquetry papers of various colors.

INTRODUCING PAGE 35

Ask the children if any of them ever have been to a toy store. Let them discuss what they saw. Then tell them that they are going to see a picture of the toy store where Don, Carol, and Nancy buy their toys.

Instruct the children to open their books to the page you show them (page 35). Allow the children to look at all the different things in the picture and to talk about them. Let them each select the ones they would like to take home. After the children have discussed the toys and selected the one they would like to own, continue the lesson.

USING PAGE 35

Begin with such questions and directions as: "How many horses are pulling the wagon on the top shelf? Find another wagon. How many horses are pulling that wagon? How many horses should pull that wagon? Find the 2 horses that should pull it. Put a small marker on each horse and move both markers down to the wagon. Are there enough horses for that wagon?"

Call attention to the 2 balls in the net. Then tell the children to look at the box with the remaining 4 balls in it. Make clear to the group that 2 balls should be put in each net. Have them put a small marker on each of the 4 balls. Let them pretend that the markers are balls. Then have them

move 2 balls to one net and the 2 other balls to another net. "How many nets are still empty? Are there more nets than balls? How many nets are still empty after all the balls have been put in nets? Put 2 markers [balls] on each net. We know that 2 balls will fit in each net. How many more balls would the store lady need to fill the rest of the nets?"

Continue with the same kind of activity for the dolls as you did for the balls and nets. Show the children that 2 dolls should go in each buggy. Then have them put 2 small markers on each group of 2 dolls and pretend that the markers are dolls. They can put the 2 markers one on top of the other. Then have the children move each two dolls to a buggy. Ask such questions as the following: "Are there enough buggies for all the dolls? How many more dolls would you need to fill the last buggy?"

Now call the group's attention to the animals and the boxes. Have the children notice that the woman is putting 2 cows into 1 box. One cow will fit on each side of the box. Instruct the children to put a small marker on each animal and pretend the markers are animals. Tell them to move the 2 animals that are alike to a box. One animal will fit on each side of the box. Only 2 animals will fit in 1 box. Have the children answer such questions as: "Are there enough boxes for all the animals? How many animals are left? How many more boxes do you need?" Be sure the children do not neglect to include the 2 cows the woman is holding.

As a variation of this activity, have the children put small markers on their desks for the ani-

mals, dolls, balls, etc., and large markers for the nets, buggies, boxes, and wagons. The children can then move the small markers to the large markers to see if there are enough containers.

APPLYING THE NEW CONCEPTS AND SKILLS

Provide several containers such as boxes, bags, envelopes, jars, etc. Direct the children to put smaller articles by twos into the containers. The smaller articles can be jacks, pencils, erasers, marbles, etc. Ask the children to tell the number of containers needed to put away a collection (not to exceed 10 objects) of articles placed before them on the table or floor. Ask a child to bring just enough boxes so that 2 erasers can be put in each box. Let him put the erasers in the box.

Any classroom activity in which the children distribute things or put things away by twos will be good practice.

Give each child a work sheet containing groups of 2, 4, 6, 8, and 10 objects, as previously described. Give such directions as: "Count the balls. Draw rings around the balls so that there are 2 balls in each ring. How many rings did you draw? How many groups of 2 are there?"

Place the chart with the apple tree before the group and put on the table 15 to 20 gummed parquetry papers of several different colors. Put each color in a separate pile or box. Give such directions as: "Let's pretend that these parquetry papers are apples. John, count the branches on the tree. Go to the table and get 2 red apples for each branch. Paste 2 of them on each branch."

Give each child a work sheet with pictures of 2, 3, 4, and 5 containers drawn on it. Direct the

children's work somewhat as follows: "How many flower pots are in the first picture? Draw 2 flowers in each flower pot. How many flowers did you draw? How many dishes are in the next picture? Put 2 apples on each dish."

Worksheet 45 of *Our Number Workshop 1* can be used with page 35.

36 Rearranging groups of 6

KNOWING YOUR OBJECTIVE FOR PAGE 36

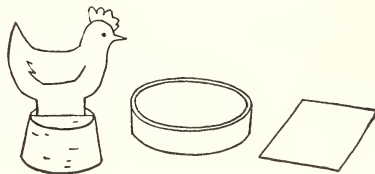
On this page the child learns to build up 6 from groups of 2 as 2, 2, 2 and to combine two of these subgroups to show 6 as 4, 2 and 2, 4.

PREPARING FOR PAGE 36

In addition to those previously listed, Pictures 7, 10, and 61-65 from *Arithmetic Readiness Cards Set 1* can be used.

If possible, secure a copy of *The Little Red Hen* and the poem "Chicken Farm" from *The Magic Stairway* (items 23 and 25 in the bibliography) to read or tell to the children.

Distribute 8 or 10 markers to each child. See the picture below. Also refer to the pictures and descriptions of markers on pages 80, 81, and 97.



Prepare a chart (on oaktag 24" x 36") with pictures of several groups of objects. Each group should contain 6 objects arranged as 2, 2, 2 or 4, 2. All objects in a group of 6 should be alike—apples or balls or balloons or trees. Include 2 groups of 6 of the same objects—one 2, 2, 2 and one 4, 2.

Prepare a work sheet for each child with groups of objects as described immediately above.

If the *Number Readiness Chart* is available, Chart 12 (top picture) may be used.

INTRODUCING PAGE 36

Show page 36 to the children and have them find the same page in their books. Tell them that Don, Carol, and Nancy are visiting in the country. Let them talk about what Carol is doing. Let them look at the picture for a short time. Then read either *The Little Red Hen* or the poem "Chicken Farm." Encourage the children to talk about chickens they have seen or fed.

USING PAGE 36

Proceed with the work somewhat as follows: "What is Carol doing in the picture on the left? How many chickens are running up to Carol? Put a marker on each of the 2 chickens that are running up to Carol. How many more chickens are getting ready to run toward Carol? Put a marker on each of these chickens. How many chickens are eating? Put a marker on the 2 chickens that are eating. How many chickens in all is Carol going to feed? How many groups of 2 are there?" Some children may say Carol is going to feed only 4 chickens because 2 are already eating. Then ask them how many chickens in all are in the picture with Carol.

"Now let's see if we can count the chickens by twos. How many chickens are eating corn? How many chickens are almost ready to run? How many chickens are running up to Carol?" Show them how to count by 2's by saying "2, 4, 6" as they look at the successive groups. Continue this practice by starting with different groups of the chickens.

Now have the children look at the picture on the right side of the page.

"How many chickens are near Carol as she is throwing down the corn? Put a marker on each of these chickens. How many chickens are eating together at the top of the picture? Put a marker on each of those chickens."

"How many chickens in all are there on this side of the page? Find the group of 4 chickens. Find the group of 2 chickens. How many chickens did you find in all?"

Be sure the children understand that 6 can be formed by three groups of 2. Then let them see that two of these groups form a group of 4, which with the third group of 2 make up 6.

APPLYING THE NEW CONCEPTS AND SKILLS

Let the children pretend that their 6 markers are chickens or make markers with corks into which paper cutouts of chickens have been inserted (see pages 79 and 80 for description). Give such directions as: "Put 2 chickens on the left side of your desk. Put 2 chickens on the right side of your desk. How many chickens are now on your desk? Now put 2 chickens in the middle of your desk. How many chickens in all are on your desk? Put your finger on a group of 2 chickens, then on the other groups. As you touch them count 'two, four,

six.' Now move the 2 chickens that are in the middle of your desk over to the 2 chickens on the left. How many chickens are on the left side of your desk? How many are on the right side? How many are there in all? Now put the chickens into groups of 2. How many groups are there? Now move 1 chicken from the middle group to each of the other groups. How many groups do you have? How many are in each group?"

Use the chart described in "Preparing for Page 36." Give directions like the following: "John, find the pictures of the apples. Point to each group of apples and tell us how many apples you see in each group. Now tell us how many apples there are in that picture." After each child in the group has had a chance to point out the groups on the chart, let one child at a time go to the chart and color the pictures as directed. For example: "Ann, color the group of 2 balls green and the group of 4 balls red. How many balls did you color?"

The same chart can be laid on the table or floor. The children can be directed to put markers on the groups and to tell the numbers as they work.

If the work sheets, described previously, have been prepared, give such directions as: "Find a group of 6 apples that is made up of groups of 2 apples. Draw rings around two of the groups so that you have a group of 4 in one ring and a group of 2 in another."

Use Chart 12 (top picture) of the *Number Readiness Chart* as outlined in *Developing Number Readiness*.

Worksheet 46 of *Our Number Workshop 1* can be used with page 36.

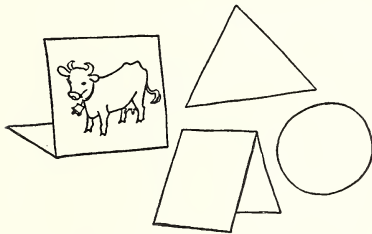
37 Rearranging groups of 8

KNOWING YOUR OBJECTIVE FOR PAGE 37

On this page the child learns to build up 8 from groups of 2 as 2, 2, 2, 2 and to combine these subgroups of 2 to show 8 as 6, 2; as 2, 6; and as 4, 4.

PREPARING FOR PAGE 37

Provide 10 or 12 markers and 3 or 4 small sticks for each child in the group. See the pictures below and on page 129.



Prepare a work sheet like the one described for 6's for use with page 36. Show three groups of 8 apples. Arrange one group as 2, 2, 2, 2; another as 6, 2; and a third as 4, 4. Similarly arrange other objects in three groups. Include for each kind of object one group of 6.

Draw lines on a sheet of oaktag (24" x 36") to divide it into sections 6 inches square. This type of chart can be used later.

Have on hand a supply of gummed parquetry papers of various colors.

Chart 13 (top picture) of the *Number Readiness Chart* can be used.

In addition to those previously listed, Pictures 18-22, 25, and 72-79 from *Arithmetic Readiness Cards Set 1* can be used.

INTRODUCING PAGE 37

Tell the children that Don, Carol, and Nancy are still visiting on the farm.

Open your book to page 37 and show it to the children. Have them find the same page in their books. Let the children look at the picture and encourage them to talk about cows, farms, and milking or some experiences they have had on a farm.

USING PAGE 37

Tell the children to look at the cows in the first picture on the left. Ask them how many cows are in this picture. Let the children count them. Some children will count them by ones. Others may count them by twos.

Now ask: "How have the cows arranged themselves? How many cows are in each group? How many groups of 2 are there? Let's count them by twos." Show the children how to count as they look at the successive groups—"2, 4, 6, 8."

After you feel sure that the children understand that the 8 cows are arranged so that there are 2 cows in each group and that there are 4 groups of 2 cows each, tell them to look at the picture in the middle of the page. Help them decide that Don is opening the gate for the cows to go through to another field. "How many cows have gone through the gate to the other field? How many cows are in each of the groups that still have to go through the gate? How many groups of 2 are

there? Let's count these cows by twos. How many cows haven't gone through the gate?"

Show the children how to make a fence on their desks with 3 or 4 sticks. Show them how to use one of the sticks as a gate. Tell them to pretend that their markers are cows. (See pages 79 and 80 for suggestions on making more realistic markers.) Tell them to arrange their 8 cows in 4 groups of 2 cows each on one side of the fence. Then have them open the gate and push a group of 2 cows through the gate to the other side. Ask: "How many cows did you move? How many groups of cows are waiting to go through the gate? How many cows are in each group? Count them by twos. How many cows are waiting to go through the gate? How many cows are there in all?"

"Now move two more groups of cows through the gate. Count by twos the cows that have gone through the gate. How many cows have gone through? How many cows are waiting to go through the gate? How many cows do you have in all?" See that the children remove the markers.

"Now look at the last picture. Don has finished putting some of the cows in the other field. How many groups of cows has he put in the other field? How many cows are in each group? Count these cows by twos. How many cows did he put in the other field? How many groups of cows did he leave in the old field? How many are in each group? Count these cows by twos. How many are there? How many groups of 4 are there in all? Count all of the cows by twos. How many are there in all?"

Again let the children make a fence with sticks on their desks. Proceed exactly as explained above and ask the same questions. In this way the children will again see the four groups of 2 rearranged to make a group of 6 and a group of 2. Then continue as follows: "Now move another group of 2 cows through the gate. Count by twos the cows you have moved. How many have you moved? Count by twos the cows that are waiting to be moved. How many are waiting? How many groups of 4 do you have? Count all of the cows by twos. How many are there?"

Finally tell the children to move one more group of 2 cows through the gate. Ask questions to show them that they now have groups of 6 and 2.

APPLYING THE NEW CONCEPTS AND SKILLS

Give each child a work sheet (described at the beginning of this lesson). Direct the work with such instructions as: "Find the picture of 8 apples that is made up of groups of 2. Color each group of 2 a different color. Find the picture of 8 apples that is made up of a group of 6 and a group of 2. Color one group red and the other group yellow. Find the picture of 8 apples that is made up of two groups of 4. Color each group a different color."

Put the oaktag chart, made as previously described, on the table. Place nearby a quantity of gummed parquetry papers separated by colors. Proceed somewhat as follows: "We are going to paste these papers on the chart to make pictures of 8. I'll put 2 green, 2 red, 2 blue, and 2 yellow papers in the first box. [Paste them in groups of 2.] John, count them by twos. Now Helen, make an-

other picture of 8. Use blue papers for one group and red for the other."

Use Chart 13 (top picture) of the *Number Readiness Chart*, if the chart is available.

Worksheet 47 of *Our Number Workshop 1* can be used with page 37.

38 Rearranging groups of 10

KNOWING YOUR OBJECTIVE FOR PAGE 38

On this page the child learns to build up 10 from groups of 2 as 2, 2, 2, 2, 2 and to combine these subgroups of 2 to show 10 as 8, 2; as 2, 8; as 6, 4; and as 4, 6.

PREPARING FOR PAGE 38

In addition to those previously listed, Pictures 41, 43-45, 51-53, and 95-108 from *Arithmetic Readiness Cards Set 1* can be used.

Have more than 10 markers and a sheet of paper available for each child in the group.

The books *Angus and the Ducks* and *Make Way for Ducklings* (items 2 and 26 in the bibliography) can be used to introduce the lesson.

Prepare for each child a work sheet similar to the one described for page 37. Use groups of 10 arranged as 2, 2, 2, 2, 2; 8, 2; and 6, 4.

Prepare a chart of oaktag exactly like the one used with page 37.

INTRODUCING PAGE 38

Read *Angus and the Ducks*, *Make Way for Ducklings*, or some other very interesting book about ducks to the group. After reading the stories, ask the children if they have any idea about what kind of animals they are going to

work with the next. Then have them open their books to page 38.

USING PAGE 38

Encourage the children to talk about Carol, Nancy, and the ducks. Let them tell what they think Carol and Nancy are doing and saying.

Again, as described in the notes for pages 36 and 37, let the children discover by counting how many ducks are in the picture on the left. Let them tell how many groups of ducks are in the picture and how many ducks are in each group. Let them count the ducks by twos.

Then proceed to the middle picture. Here again continue with the work as for page 37, asking similar questions. Let the children discover that a group of 2 ducks has gone to the bank and that 4 groups of 2 ducks have stayed in the water. Help them identify the group of 8 in the water by seeing the two groups of 4. Also let the children count the ducks by twos.

Put a sheet of paper on each child's desk and tell him to pretend that it is a pond and that the markers are ducks. Give directions and ask questions that will reproduce the situation in the picture. Show them how to arrange the ducks in groups of 2. Then show them how to combine groups of 2 to make groups of 4. Finally have them move the group of 2 from the pond to the grass (desk). Ask questions similar to those described in the notes for page 37.

Now have the children look at the last picture. "How many more ducks have climbed out of the water and are on the grass? How many ducks are still in the water? [Help the children identify this

group of 6 by seeing the groups of 4 and 2.] How many ducks are there in all? Count by twos if you do not know." The children may point to each group as they talk about it.

Now have the children put the 10 ducks (markers) in the pond (sheet of paper) arranged in groups of 2. Direct them to move 2 ducks to the grass (desk) and to arrange those in the pond in groups of 4. Ask the children questions to bring out the identity of the group of 8 (as 4,4) and 2 which make up the 10.

Next direct them to move 2 more ducks to the grass. Ask questions to bring out the identity of the group of 6 (as 4,2) and 4 which make up the 10.

Finally have the children move 2 more ducks to the grass. Ask questions to establish the identity of the group of 8 on the grass (as 4, 4) and 2 in the water which make up the 10. This successive breaking up and re-forming of subgroups is important.

APPLYING THE NEW CONCEPTS AND SKILLS

Let the children play that they are ducks. Have them arrange themselves in groups as shown in the book. Designate one place as a pond and another place as the grass. Use questions and directions like those already described.

Use the work sheets in the same manner as described for groups of 8 in "Applying the New Concepts and Skills" for page 37. The children will color groups of 2, 2, 2, 2, 2; 8, 2; 6, 4.

Use the oaktag chart and parquetry papers as explained for groups of 8 for page 37.

Worksheet 48 of *Our Number Workshop 1* can be used with page 38.

39 Recognition of 6, 8, and 10

KNOWING YOUR OBJECTIVE FOR PAGE 39

This page gives practice in recognizing groups of 6, 8, and 10 by the subgroups of 2 and the subgroups of multiples of 2.

PREPARING FOR PAGE 39

Have on hand *Chicken Little Count-to-Ten* and *The Story About Ping* (items 7 and 44 in the bibliography).

The best device to use with this page is the frame, which was used with pages 11 and 23. See pages 86 and 87 for a description of the frame. Provide a frame for each child. Have at hand a few large paper clips or clamps to hold the frames in place on the page.

Variety can be given to the use of the page by using the single-view frame described on page 86. Give each child 10 markers.

Have available for each child a sheet of paper ruled into eight sections. Also have available for each child a sheet of transparent paper cut to fit the page in the book.

INTRODUCING PAGE 39

Read one or both of the stories mentioned above to the children if there is time. Then have the children open their books to page 39.

Give a frame to each child and be sure it is placed on the page with the star at the top. Fasten the frame to the books with a clip for any child who has trouble keeping it on in the right position.

With the star at the top the frame reveals only those pictures that contain 6 or 8 chickens or ducks.

USING PAGE 39

Ask such questions as: "How many brown chickens are in the first picture? How can you tell without counting that there are 8 chickens? Find another group of brown chickens. How many chickens are in that picture? How do you know? [Work for such responses as: "I counted by twos," "There are three groups of 2."] Now look up at the top of the page again. How many ducks do you see? What groups do you see? [Help them "see" the 4, 2 grouping]."

"Find a picture showing ducks running. How many ducks are in this picture? What groups do you see? [6, 2] How many ducks have their heads under water? What groups do you see? [4, 4] How many ducks are eating?"

"Find the picture of the black-and-white spotted chickens. How are they grouped? How many chickens are in that picture? Find the white chickens that are running. How are they grouped? How many white chickens are in this picture?"

Assist the children to see the subgroups of 6 as 4, 2; subgroups of 8 as 4, 4 and as 6, 2. If necessary, have them show the groups with markers.

Now have the children turn their frames so that the circle is at the top of the page. Help them adjust their frame and fasten it to the book if necessary. In this position the frame shows only pictures of 6 or 10 chickens and ducks.

Ask the children what they see in the first picture at the top of the page. "What are these chickens doing? What groups do you see? How many chickens are in this picture? Find another picture that shows brown chickens. What are they doing?"

What groups do you see? [8, 2] How many chickens are in this picture?"

"Find another picture that shows 10 chickens. What color are they and what are they doing? [Help them see the subgroups 4, 6.] Now find a picture that shows just 6 chickens. What color are they? What are they doing?"

"Find the ducks that are sitting down. What groups do you see? How many ducks are there in this picture? Find the picture of the ducks that are swimming. How many ducks are there? Find the ducks that are running. How many ducks are there? Now find the picture of the ducks that are diving under the water. How many ducks are there in that picture?"

Now have the children turn their frames so that the star is at the bottom of the page. In this position the frame shows only pictures of 8 and 10. Let the children take turns finding a picture that shows 8 (or 10) and telling what the picture shows. Ask what groups they see for each picture.

Finally turn the frames so that the circle is at the bottom. The pictures now show 6, 8, and 10. Proceed as before.

Remove the frames and give such directions as: "Find a picture that shows 6. Tell us what you see in that picture. Find a picture that shows brown chickens running. Tell us how many chickens are in this picture." The single-view frames can be used by the children to show the pictures.

APPLYING THE NEW CONCEPTS AND SKILLS

Let the children arrange markers on their desks in groups of 6, 8, and 10 in response to directions requiring the arrangement of 6, 8, and 10 into

groups of 4, 2 or 6, 2, etc., as developed in pages 36, 37, and 38.

Fasten a sheet of transparent paper over page 39 in each child's book. Then give such directions as: "Put a red X on all the pictures of chickens that show 8. Put a green X on all the pictures of ducks that show 10."

Charting the Course

The fundamental principles of measurement introduced on pages 28-31 apply to all types of measurement situations. A *standard* is, therefore, needed also for measures of volume or capacity. However, the concept of volume is not as simple as the concept of length in a straight line. Containers of different shapes or sizes are often deceptive as to capacity. Children are prone to base their judgment concerning the volume of a quantity of liquid, for instance, on the number of containers filled, without taking into account the sizes of the containers or the levels to which they are filled.¹ In measuring volume or capacity, several copies of a standard may be used. Also, measurement may be done by using one copy of the standard repeatedly. It is important that children acquire some understanding of these activities before the conventional standards like *quart* or *pint* are introduced. Even children who handle quarts and pints of milk frequently and use these terms many times, may not realize that the terms *quart* and *pint* refer to bottles of standard sizes, not to any large or small bottles. The pictures on pages 40-41, and the suggested lesson activities in these notes, will help teachers establish readiness for the concepts *quart*, *pint*, and the like, as the conventional standard measures of capacity or volume.

40

Measurement of volume or capacity

KNOWING YOUR OBJECTIVE FOR PAGE 40

On this page the child is introduced to the idea of using a measurement model or unit to measure

capacities or volumes. He first uses the measurement model or unit once only for each quantity measured and then uses more than one copy of the model. He measures to find out whether a quantity is more than or less than another quantity.

Worksheet 49 of *Our Number Workshop 1* can be used with page 39.

capacities or volumes. He first uses the measurement model or unit once only for each quantity measured and then uses more than one copy of the model. He measures to find out whether a quantity is more than or less than another quantity.

¹ See Item 106 in *Number Readiness in Research*.

PREPARING FOR PAGE 40

Provide small containers such as match boxes, berry boxes, cups, etc. Be sure to have several copies (3 or 4) of each of two containers. Also have several large containers (quart to gallon size) and about one gallon of some material (sand, dried peas, beans, corn, etc.) that can be measured without too much confusion.

If there is time, the children can make large and small boxes according to the directions given on page 82. If the paper used varies in size from six-inch squares to twelve-inch squares, the boxes will be of varying sizes.

INTRODUCING PAGE 40

Let the children discuss berry picking and especially the containers they used for the berries as they picked them.

USING PAGE 40

Show the children page 40 in the book and have them open their books to that page. Tell the children that Don and Carol, during their visit to the country, decided to pick strawberries one day. Let the children decide, after looking at the first picture, that Don and Carol have been picking berries for a short time and are measuring them to see who has picked more berries. Direct attention to the pails that they are using. Let them decide who has the larger pail. Then help them see that it was difficult, before using the boxes, to know which pail had more berries in it when neither pail was full. Demonstrate this difficulty by letting the children guess which of two containers (of different sizes) filled with different amounts of beans (or dried peas, sand, corn, etc.) contains more.

Tell the children that Don and Carol could not tell who had picked more strawberries until they both put their berries into boxes of the same size. Don picked his strawberries in a small pail and filled the pail. Carol picked her strawberries in a larger pail, but she did not fill the pail. When Don emptied his pail of berries into the box he found that he had filled the box and still had some left in the pail. When Carol emptied her pail she found that she did not have enough to fill one whole box. Ask: "Who picked more berries? How can you tell?" Let the children tell their ideas and then continue the lesson.

Now have the children look at the other picture on page 40. Explain to them that all of the boxes are of the same size. Ask such questions as: "Do either Don or Carol have any strawberries left in their pails? Now who picked more berries? How can you tell? How many boxes of berries did Don pick? How many boxes of berries did Carol pick? How many more boxes of berries has Carol picked than Don?"

"How many empty boxes are still in the pile? Is there any way that Don and Carol could tell just how many berries to pick in order to fill the other three boxes?" Work for such explanations as: "The children could take the boxes with them and fill the boxes." "They could empty the three boxes of berries the boy picked into the pail and see how far the pail should be filled. Then empty the pail again and fill it just that far." "They could empty three of the girl's boxes into the pan she had used to see how far to fill it again." Encourage originality from the children.

APPLYING THE NEW CONCEPTS AND SKILLS

Give the children the various containers that have been brought to class. The children should have 3 or 4 containers of the same size. Partly fill with beans, dried peas, stones, sand, etc., two larger containers that are different in shape or size and let the children decide which contains the greater amount. Then let two children measure by putting the contents into small containers all equal in size. Let each child have an opportunity to participate. Use various large containers.

If there is time, let the children make boxes as suggested in "Preparing for Page 40." They can use them to measure substances provided.

Worksheets 50 and 51 of *Our Number Workshop 1* can be used with page 40.

41 Measurement of volume or capacity

KNOWING YOUR OBJECTIVE FOR PAGE 41

On this page the child continues to have experiences in using a measuring model or unit to measure capacities or volumes. He uses one copy of the model or unit more than once to measure a designated quantity of material and learns to discriminate between situations in which he can and cannot tell whether one quantity is greater than another.

PREPARING FOR PAGE 41

Have available various containers such as pint milk bottles, quart milk bottles, quart fruit jars, pint fruit jars, half-pint fruit jars, glasses, cups, etc. Be sure to have two or three of several con-

tainers that are alike in size and shape. Also have several small cups that are alike. Provide sand, beans, dried peas, stones, or another material for measuring.

Each child will need five markers.

Furnish each child with a work sheet on which pictures of containers of various kinds, sizes, and shapes have been drawn. Some should be alike in size and shape, one should be obviously the largest, and one obviously the smallest. See the picture at the right.

Divide a large piece of oaktag into about six sections. Draw or paste about four or more bowls or containers in each section. In some sections the containers should be alike in size and shape and in others they should be of various sizes and shapes. Show varying quantities of materials in the containers in a manner similar to those in the pictures at the right side of page 41.

INTRODUCING PAGE 41

Review briefly with the children the activities pictured on page 40. Again make clear that Don and Carol, on page 40, used more than one box of the same size to find out how many berries they had picked.

Suggest that the children open their books to page 41 to find out how Don and Carol are measuring their berries now.

USING PAGE 41

Tell the children that Don and Carol ran out of boxes. So they decided to put all the berries they picked into the one big basket. Each picked berries and put them into a small box and then, when it was full, poured the berries into the large



basket. Be sure that the children note that the two boxes are equal in size.

Ask such questions as: "How many boxes does Carol have in her hands? How many boxes does Don have in his hands? Do you know of any way that Carol and Don can keep track of the number of small boxes of berries each picks?"

Call the children's attention to the red and blue lines on the side of the large basket. Tell them that Don and Carol made these marks with a crayon to keep track of the boxes of berries. Explain that Carol makes a red line for each box of berries she pours into the basket and that Don makes a blue line for each box of berries he pours into the basket. Ask: "How many boxes of berries has Carol put into the basket? Don is pouring a box of berries into the basket and will make a blue mark when he is through. How many boxes of berries has he picked and put into the basket? Which holds more berries, the small box or the big basket? Is the big basket almost full? How many more boxes of berries do you think they will have to pick to fill the big basket?" The purpose of this question is to stimulate discussion.

Next direct the children's attention to the glasses and jars at the right on page 42. Then proceed somewhat as follows.

"How many glasses of tomato juice are there at the top of the page? Which glass has more tomato juice in it? [Let them describe it by size or position.] What makes you think that glass has more juice in it? Can you tell for sure without measuring?"

Now have the children look at the two glasses of grape juice. Ask them how many glasses of grape juice there are. Have them describe the glass they think has the greater quantity of juice in it. Continue with the same type of questions as for the tomato juice. Lead the children to see that they are sure because the glasses are filled to the same place and one is smaller than the other.

Treat the pictures of the jars of honey in the same manner. Be sure the children realize that the only way to be sure which holds more is to put the honey into the same size glasses. Then call the children's attention to the two bottles of tomato juice in the second row. Ask the children if one jar has more juice in it than the other one. Be sure they know the reason why they can tell without measuring that both jars hold the same amount.

Call the children's attention to the yellow and blue bowls of berries in the middle of the picture. "How many yellow bowls are there in this picture? How many blue bowls are in the picture? Do all the bowls have berries in them? How many are empty? Put markers on all the bowls that you think will hold more berries than the empty bowl. [Check the result.] Now take off all the markers and put them on the bowls you think would hold less berries than the empty one." Check the result and have all markers removed.

"Now look at all the yellow bowls and all the blue bowls. Don picked the berries that are in the yellow bowls, and Carol picked the berries that are in the blue bowls. Who do you think picked more berries, Don or Carol? Can you be sure without measuring?" Help the children to see that the bowls in the two rows vary in size and for that reason it is impossible to be sure which row of bowls holds more berries. "How could Don and Carol have found out who had picked more?"

Finally have the children look at the bowls at the bottom of the page. Ask the children how many pink bowls there are and if they are all full. Then ask them how many green bowls there are

and if they are all full. Ask which row has more berries in it. Ask: "Would it be necessary to measure them? Why not?" Be sure the children understand that all the bowls are the same size and that, therefore, it is easy to see that the row of pink bowls has more berries because there is one empty bowl in the row of green bowls.

APPLYING THE NEW CONCEPTS AND SKILLS

Duplicate the measuring situations shown in the pictures at the right side of page 41 by using pint and quart bottles and other containers. Let the children take turns making decisions, devising ways of proving their statements, and doing the actual measuring.

Charting the Course

Up to this point some of the ways of looking at six and seven have been shown on pages 20, 25, and 36 and in the related activities. The meaning of these numbers will now be developed further by focusing attention upon possible rearrangements of their subgroups into pairs of subgroups (which may be referred to as "component" groups and which will in the next grade be learned as "basic facts"). Rearrangements of the subgroups of the number five (2, 3 or 2, 2, 1) into two sets of subgroups (4, 1 and 3, 2) were shown in this way on page 24. The subgroups of the number six (1, 2, 3 or 2, 2, 2) can be rearranged into three sets of subgroups (3, 3; 4, 2; 5, 1). Likewise the subgroups of the number seven can be rearranged into three sets of subgroups (4, 3; 5, 2; 6, 1). The rearrangement or assembling of the small groups into pairs of subgroups is another step toward readiness for the addition and subtraction facts. The previous experiences in recognizing the model groups of 2, 3, and 4, and in using these model groups in building the subgroups of 5 and 6 and in breaking down groups of 5 and 6 into their component subgroups, may now be applied in becoming acquainted with new ways of combining the small groups. Pages 42-46 and the suggested activities in these lesson notes will help the teacher in this important phase of number readiness.

Furnish each child with a copy of the work sheet containing pictures of jars, bottles, boxes, etc., of various and equal sizes. Give such directions as: "Color red the bottle that holds the most. Put an X on two boxes that will hold the same amount."

Have each child make a bowl out of modeling clay. Let them each measure sand or other material to see whose bowl holds the most, whose bowl holds the least, and whose are the same size.

Use the chart containing pictures as shown on page 136. Then ask questions similar to those described in "Using page 41" for the bowls.

Worksheets 52, 53, and 54 of *Our Number Workshop 1* can be used with page 41.

KNOWING YOUR OBJECTIVE FOR PAGES 42-43

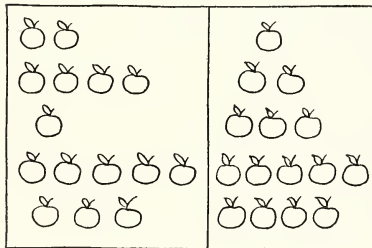
These pages develop the meaning of 6 as made up of the subgroups 1, 2, 3, which, when combined, show 6 as 3, 3; as 4, 2; as 5, 1. These pages focus attention on the rearrangement of the subgroups of 6 and complete the introduction of 6 by presenting the pairs of subgroups from which 6 may be derived by combining.

PREPARING FOR PAGES 42-43

Have available for each child in the group a quantity of markers (buttons, little sticks, checkers, etc.). There should be more than 6 for each child.

Prepare for each child a work sheet divided into 6 (or 9) sections. In each section show 6 rows of 6 objects each. In one section show apples in outline, in another cars, etc. Have available a supply of gummed parquetry papers (about 12 for each child) and 2 or 3 sheets of oaktag (24" x 36").

Prepare for each child a work sheet like the one in the picture below.



In addition to those previously listed, Pictures 8-11 and 61-66 from *Arithmetic Readiness Cards Set 1* can be used.

INTRODUCING PAGES 42-43

Ask if any of the children have seen a "puppet show." If any have, let them talk about it. If no one has, explain what a puppet show is.

Explain that Don and Carol and some of their friends are watching a puppet show.

USING PAGES 42 AND 43

Draw the children's attention to the boys and girls sitting watching the show in the picture on the left. Ask such questions as: "How many children are watching the show? Where are Don and Carol sitting? How many children are sitting in that row? How many children are sitting in the back row? Why are the children in the back row having trouble seeing the show? How many groups of 3 are there? How many groups of 2 are there?" Let the children arrange their chairs like the ones in the picture. Be sure they realize that there are 3 chairs in each row and that there are 2 rows. Ask the group if they know of a better way of arranging the chairs so that all the children can watch the show without having to bend to one side.

Next direct the children's attention to the picture on the right side of the page. "How did the children in the picture arrange their chairs? Can they see better? Why? How many children are there? Where are Don and Carol sitting? How many are in their row? How many children are in the row in front of them? How many are in the row behind them? Now, John, arrange the chairs in the same way as those in the picture. [One child

should rearrange the chairs that are in 2 rows of 3 each. Let six children sit in them.]"

"Can you see better than you did the other way? Each of you take some of your markers and arrange them in the same way as the chairs." Be sure each child has more than 6 markers so that he is forced to select the correct number. Tell them not to count the markers before arranging them. The objective is to get them to see that the "pyramid" arrangement takes 6 objects when the longest row has 3 objects in it. Let the children think of the remaining two short rows as making another 3. Test them with 10, 5, 9, etc., objects arranged in pyramid and incomplete pyramid formations.

Direct a child to go to the blackboard and make X's to illustrate how the 6 chairs are arranged in two groups of 3 as in the picture on the left side of the page. Let another child go to the blackboard and show with X's how the chairs are arranged in the picture on the right in three rows of 1, 2, and 3 objects.

Now have the children look at the pictures on page 43.

Point to the picture of the blue clown hats and ask the children: "How many blue clown hats are there? Do you think the hats are being arranged like the chairs in the last picture? How many more hats are needed? Find the picture that shows this. [Let them describe it by color.] Where would you put the yellow hat?" Let one child go to the blackboard and show the group the correct position by drawing hats or X's.

"Look at the clowns with red suits. How many are there? We want 6 clowns. Which group below

should we put with the ones with red suits to make 6 clowns? [Clowns with blue suits.] Helen, show us on the blackboard how you will arrange them. Let's all of us put counters on our desks to show how we'd arrange the clowns. Now fix them like the last picture on page 42."

"Look at the dogs that are standing on yellow balls. How many dogs are standing on yellow balls? Which dogs below would you put with them so that there will be 6 dogs in all?" Again let a child show the arrangement on the blackboard and then have the children use markers to show the arrangement and rearrangements as described immediately above.

Proceed in this way with each of the other three pictures on page 43.

As a final part of the work with this page let the children take turns arranging "pictures" of 6 from a group of small objects thrown on a table in random fashion by you. The child should decide upon the arrangement (3, 3; 2, 2, 2; 4, 2; 1, 2, 3). Give much practice in this and continue it for 6 along with the work for the other numbers on the following pages.

Finally get the children to "see," without rearranging them manually, the "pictures" in groups of 3, 4, 5, or 6 objects thrown on the table. Discourage counting and emphasize recognition of the quantity by the groups. As time goes on control the time during which the child sees the group of objects by covering or screening them with paper or cardboard. Eventually control the time so that he cannot count the objects. Work individually with the children. When you are working

with one child, let the others in the group stand by to watch. Let those who are standing by verify or correct the response.

APPLYING THE NEW CONCEPTS AND SKILLS

Give each child a work sheet divided into 6 to 9 sections, each of which contains six rows of 6 objects. Give directions like the following: "In the first box color 6 apples red. When you are through, the apples you color should be in rows as the children in our book were. In the next box color 6 cars blue. Color the cars so that you will have them in three rows. Now color 6 trees green. Color them so that they will be arranged differently from the apples and cars you colored."

Give as much experience as time permits in arranging and rearranging 6 objects from supplies in excess of 6. Try to get the children to rely upon arrangement of groups to determine the number of objects, instead of counting.

The children may be given gummed parquetry papers and directed to paste them on work sheets in arrangements of 6, or to take turns pasting them on a chart (oaktag 24" x 36") in arrangements of 6. A child should paste only one paper, then another child pastes the next paper, and so on.

Distribute the work sheets on which there are apples. Have the children color the 2 apples at the top of the left side red. Then have them find enough apples on the right side that, when placed with the 2 on the left side, make 6. Have them color them red also. Continue in this way for each group of apples.

Worksheets 55, 56, and 57 of *Our Number Workshop 1* can be used with pages 42-43.

44 - 45 Component groups of 7

KNOWING YOUR OBJECTIVE FOR PAGES 44-45

These pages develop the meaning of 7 as made up of the subgroups 2, 2, 3, which, when combined, show 7 as 4, 3; as 6, 1; and as 5, 2. These pages focus attention on the rearrangement of the subgroups of 7 and complete the introduction of 7 by presenting the pairs of subgroups from which 6 may be derived by combining.

PREPARING FOR PAGES 44-45

Have on hand if possible *The Seven Little Elephants* (item 40 in the bibliography).

Chart 12 of the *Number Readiness Chart* may be used with this page.

Provide for each child a set of 10 or 11 markers without numbers.

Provide for each child a sheet of plain paper or drawing paper folded or ruled into six sections.

Prepare for each child a work sheet containing pictures of objects or animals. The picture should show arrangements of 2, 3, 4, 5, 6, and 7 as pictured on pages 23, 27, and 43. Provide each child with numbered markers for each picture.

In addition to those previously listed, *Pictures 12-17* and *66-71* from *Arithmetic Readiness Cards Set 1* (see page 104) can be used with pages 44-45. If these cards are not available, this is a good point at which to begin making a similar set of cards to use in practicing recognition of the number of objects in organized and unorganized groups. Make several cards (6" x 9", 10" x 12", or 8 1/4" x 11") for each number. Draw or

paste pictures of objects on the cards. Use the same objects on a card, but vary the objects from card to card. Make one set for each of the numbers (2, 3, 4, 5, 6, 7, 8, 9, and 10) in which the objects are arranged in an organized manner as shown on pages 23, 27, 43, 54, and 55 of the book. Make another set for each number in which the objects are shown as unorganized. A good way to make these unorganized arrangements is to throw jacks (using the desired number) down on the card. Then paste or draw pictures of objects or animals in the positions of the jacks. Do not put small pictures too far apart. As time goes on, add to this set of cards by making additional ones for each number. Cards for 8, 9, and 10 should not be used until pages 47-53 are used.

INTRODUCING PAGES 44-45

If there is time, read *The Seven Little Elephants* to the group. After a discussion of the story show the children page 44 in your book and have them open their books to that page.

Tell the group that the girls in the animal costumes are some of Carol's friends. They have been in a little animal play. Now they are going to have their pictures taken.

USING PAGES 44-45

Explain that the picture on the left side of page 44 shows how the girls arranged themselves to have the first picture taken. Ask: "How many girls are having their picture taken? Find the girls who are standing. How many are in that row? Find the girls who are kneeling. How many are in that row? Find the girls who are sitting. How many are in that row? Now, John, point to each row and tell

me how many are in it as you point." This exercise can be repeated by referring to the girls by costume instead of by position.

Point out that it is easy to see the group of 2 at the top of the page, the group of 2 at the bottom of the page, and the group of 3 in the middle. The objective is to get the children to recognize this arrangement as 7.

"Now take the piece of paper you have and cover the girls dressed as kittens. How many do you see now? How many did you cover? Remove the paper. How many girls do you see? Cover the girls dressed as bunnies. How many girls do you see? How many did you cover? Remove the paper. How many do you see?"

Send more than 7 children to a space in the room and tell them to arrange a group as the girls did in the picture.

When they have returned to their seats, direct them to take some of their markers (each child should have 10 or 11) and arrange them in the same way as the girls. Discourage counting. Try to get them to know 7 as a row of 3 with a row of 2 on each side. Several children can be permitted to show this arrangement of 7 on the blackboard.

Now direct attention to the other picture on page 44. Let the children give reasons for the new arrangement and be sure they know by counting first that there are 7 girls in this picture. Then proceed with the same activities as described above for the other picture.

Now direct the group's attention to page 45 and proceed somewhat as follows: "Look at the

animals in the blue field at the top of the page. How many animals are there in that field? Let's find some more animals to put with these 5 so that we can arrange them in the same way the girls arranged themselves on page 44. Shall we use the rabbits in the yellow field or in the green field? To make a picture like the first one of the girls on page 44 would you, Sharon, put the 2 rabbits above the bears or below the kittens? Let's make a picture like the other one of the girls. Tom, where will we put the 2 rabbits? How many animals will we have in all?"

Let one child go to the blackboard and show the above arrangements by drawing outline figures of animals or X's.

Proceed in this manner with each of the other five sets of pictures. For the two involving 7 as 6, 1 and 1, 6, let the children decide where to place the second group. In each case call the children's attention to the group in the large box and have them find the correct number in one of the smaller boxes beneath.

When the work with page 45 has been completed, let the children take turns arranging "pictures" of 7 from a group of small objects thrown on a table (or floor) in random fashion. The child should decide upon the arrangement (4, 3; 2, 2, 2, 1; 3, 3, 1; 5, 2; 6, 1). Occasionally throw 6 objects instead of 7. Let the child discover this while he is arranging the objects. He should then make a "picture" of 6.

Finally lead the children to "see," without rearranging manually, the "pictures" in groups of 3, 4, 5, 6, or 7 objects thrown in random fashion

on the table. Discourage counting and emphasize recognition of the quantity by "seeing" the subgroups. The child can be prevented from counting by covering or screening the objects with a piece of paper or cardboard before he has had time to count. As you work with one child let the others stand by to verify or correct the responses.

APPLYING THE NEW CONCEPTS AND SKILLS

Use Chart 12 (bottom picture) of the *Number Readiness Chart*, if it is available. Follow the directions in *Developing Number Readiness*.

Give each child a sheet of plain paper folded or divided into six sections. Give such directions as: "In the first box draw 7 apples. Make them in whatever picture [or arrangement] you wish. Now draw pumpkins in the next box. Make a different picture of 7. Draw pictures in each of the other boxes. Make as many different pictures of 7 as you can." Be sure to examine the work and to show the rest of the group the pictures made by different children.

Use the *Arithmetic Readiness Cards Set 1* (or the ones you made) described in "Preparing for Pages 44-45." Let the children have a brief glimpse of each card; then call on a child to tell how many objects he saw. Begin with the cards that show the organized groups of 3, 4, 5, 6, and 7, and end with the cards that show the unorganized or random groups. Do not allow enough time to count the objects.

Provide each child with a work sheet containing groups of objects arranged as shown in the book on pages 23, 27, and 43 for groups of 2, 3, 4, 5, 6, and 7. Give each child markers numbered from

1 to 7. Direct him to put the correct marker on each picture to show how many objects he sees.

Worksheets 58, 59, and 60 of *Our Number Workshop 1* can be used with pages 44-45.

46

Review of 6 and 7

KNOWING YOUR OBJECTIVE FOR PAGE 46

On this page the child practices his skill in recognizing groups of 6 and 7 by their subgroups.

PREPARING FOR PAGE 46

Have on hand *Come Meet the Clowns* (item 8 in the bibliography).

The best device to use with this page is the frame, which was used with pages 11, 23, and 39. See pages 86 and 87 for a description of it. Provide a frame for each child. Have at hand a few large paper clips or clamps to hold the frames in place on the page.

The use of the page can be varied by using the single-view frame described on page 86.

Furnish each child with 10 to 12 markers without numbers, 12 markers with the number 6 on them, and 12 with the number 7 on them.

Provide enough transparent paper so that each child can have a piece the size of page 46.

INTRODUCING PAGE 46

Read or tell the story *Come Meet the Clowns* to the children if there is time.

Ask the children if they can answer the following "riddle": "Six jolly clowns were standing in a row. One more joined them. How many were there then?" If they cannot answer this riddle, tell

them the answer. Then see if they can answer another riddle. "Three dancers were dancing in a ring. Three more came to dance with them. How many were there then?"

Now have the children open their books to page 46. Let them look at the clowns and girl dancers. Direct their attention to the way in which the clowns and dancers are holding hands as they dance. Give each child a frame. Have them put the frame on the page so that the circle is at the top. Help fasten the frame to the book with a large clip for those children who have difficulty holding it in place. In this position only the pictures showing 6 are visible.

USING PAGE 46

Ask the children what they see in the first picture from the left at the top of the page. "Let's see if we can tell how many red clowns there are without counting them. How many are there, John? [Work for the answer "6." Assist them to see by groups.] How do you know that there are 6 red clowns? [two groups of 3.] Show on your desk with counters how the 6 red clowns are grouped." Discourage counting. Let the children learn to assemble the two groups of 3 to make 6.

"Find another picture that shows 6 clowns grouped in the same way. What color are these clowns? Show with markers on your desk how these yellow clowns are grouped."

"Now look at the clowns in the last picture in the top row. What color are they? How many clowns are in that picture? It is easy to remember that when you see four in one group and two in another there are six in all. Show with counters

how these 6 clowns are grouped. Find another picture that shows four clowns in one group and two in the other. What color are they? How many clowns in all are in that picture?"

"Look at the girl dancers in the red dresses. How many dancers are there in all? How do you know without counting to 6? How many dancers are in one line? How many dancers are in the other line? Show with markers how they are grouped. Can you find another picture in which the girls are grouped this way?"

Proceed in this way with the other groups of 6.

Next have each child arrange markers as the red clowns are. Then give such directions as: "Move some of the markers so that they are grouped like the blue clowns. Now group them like the yellow clowns."

Conclude with the generalization that all the pictures show 6.

Now have the children turn their frames so that the star is at the top of the page. Only groups of 7 are now visible.

Have the children start with the picture of the clowns in blue. Continue for all the pictures of 7 in the same way that the sixes were handled. Be sure at the end of the lesson with this side of the frame that the children make the generalization that all the pictures show 7.

When the frame is placed with the circle at the bottom of the page the pictures will show both 6 and 7. Ask the children to find all the pictures that show six. They can describe them by saying the color and whether they are clowns or girls. Do the same for the sevens.

Now have the children place the frame on the page with the star at the bottom of the page. With the frame in this position the pictures again will show both 6 and 7. Let the children take turns describing the pictures: "I see 6 red clowns. I see 7 girls in yellow." Require each child to give a reason for his answer: "Because there are 3 here and 3 there. There are 2, 2, 2, and 1 more."

Finally have the frames removed and give each child 12 markers with "6" written on them and 12 markers with "7" written on them. Tell them to put a marker on each picture. "Be sure to put markers that say 6 on the pictures of 6 and markers that say 7 on the pictures of 7." Be sure the children have more than enough markers for the 16 pictures.

Charting the Course

Among the numbers from one to ten, the numbers *four* and *nine* have a special characteristic. Four can be separated into two groups of twos, and nine can be separated into three groups of threes. That is, nine can be broken up into equal subgroups in such a way that the number of objects in each is the same as the number of subgroups. Nine is the only odd number less than ten that has equal-sized subgroups. Page 47 and the suggested activities to go with it are devoted to helping children see nine as three threes. Although this page may also be used to illustrate 9 as a 6 and 3, this is not emphasized at this point. This particular set of component groups of 9 is shown on page 50.

47 9 as 3, 3, 3

KNOWING YOUR OBJECTIVE FOR PAGE 47

On this page the child learns to build up 9 from groups of 3, 3, 3 and to combine two of these sub-

APPLYING THE NEW CONCEPTS AND SKILLS

Have each child put a sheet of transparent paper over the page in the book. Direct him to put an X on each picture that shows 6 and a circle on each picture that shows 7.

Use an oaktag chart like the one described on page 131. Give such directions as: "Mary, take some red papers from the table and paste them in the first box. Use just enough to make a picture of 6. Try to do it without counting to 6."

Let the children play that they are clowns or dancers. Have them arrange themselves in groups as pictured in the book.

Worksheet 61 of *Our Number Workshop 1* can be used with page 46.

groups to show 9 as 6, 3 and 3, 6. (The component groups of 9 are presented on pages 50-51.)

PREPARING FOR PAGE 47

Have available for each child in the group about 12 markers.

Divide a piece of oaktag (24" x 36") into about 8 sections. Draw pictures of objects in each section. In six of the sections show 9 as 3, 3, 3 or 6, 3. In two of the boxes show 6 as 3, 3 and 8 as 3, 3, 2.

If possible, have available some rhythm band instruments such as bells, sticks, drums, triangles. If the rhythm band instruments are not available, have other objects like checkers, spools, etc.

Prepare for each child a work sheet divided into sections. In each section show 3 or 6 objects. Leave space for the child to draw additional objects to make the total equal 9.

Chart 13 (bottom picture) of the *Number Readiness Chart* may be used with this page.

Supply each child with 4 circular pieces of paper about 6 inches in diameter.

INTRODUCING PAGE 47

Show the children page 47 in your book and have the children open their books to that page. Allow the children to look at the pictures on the page for a short time and ask them what instruments the children in the pictures are playing. Tell them that these are some of the children that were in the band at the school program. Then ask them what instruments they see on your desk. After the children have discussed the different instruments that are on the desk, continue the lesson.

USING PAGE 47

First ask the children: "How many instruments do you see on the table in the first picture? How many different kinds of instruments do you see? Name them. How many are there of each kind?" Emphasize the fact that there are three groups of 3. "How many children are standing around the

table? They are standing in how many groups? How many are in each group? Are there three groups of 3?" Be sure the children see that the 9 is made up of 3 groups of 3 before they go on to the next picture.

"Now look at the next picture to see how the children have arranged themselves to play in the band. How many children are in the middle picture? How many rows are the children in? How many children are standing in each row?" Emphasize the fact that there are 3 children in each row, no matter which way the rows are considered —up and down or across. This "square" idea of the arrangement of 9 is of value to the children in enriching its meaning. "Now find a group of 6 in this picture. What other group is there besides this group of 6?" Let other children find different arrangements of 6, 3.

"Look at the last picture at the top of the page. Are the children arranged in groups of 3?" Let the children describe the groups. "Find a group of 6 and a group of 3 in this picture." More than one 6, 3 arrangement should be pointed out.

Let 9 children with rhythm band instruments, if they are available, arrange themselves in as many different ways as they can to show 9 as 3, 3, 3 and 6, 3. It should become clear that two of the groups of 3 join to make the group of 6.

Direct the children to arrange 9 of the objects or markers that they have to show 9 as 3, 3, 3 and 6, 3. They should learn to form groups of 9 from collections of more than 9 objects without counting. The completeness of the group should be clear from the arrangement.

Tell the children to look at the pictures at the bottom of the page. Ask them how many children are at the left side of the page and have them tell how they know. "If all the children wanted to sit down on chairs, how many chairs would they need? John, find a picture with enough chairs in it. Don't count the chairs, look at the groups. Tell us the color of the chairs. Helen, find another set of chairs for the children. What color are they? Is there another set of chairs for the children? How do you know we cannot use the yellow chairs?"

Next have the children find the pictures that show tables. "How many children shall we put around each of the blue tables? Put three of the paper tables [circles of paper] on your desk. Show with markers how you would arrange the children at these tables. What trouble would you have in putting the children at the green tables? Try it with four of the paper tables and 9 markers for children."

Use Chart 13 (bottom picture) of the *Number Readiness Chart*, if it is available. Follow the instructions given in *Developing Number Readiness*.

APPLYING THE NEW CONCEPTS AND SKILLS

Put the oaktag chart before the children. Let them take turns identifying groups of 9.

Encourage the children to bring in pictures that show three groups of three. Paste the pictures they bring in on a large chart.

Distribute the work sheets with pictures of groups of 3 or 6 objects. Tell the children to complete each drawing so that it will have 9 objects.

Worksheet 62 of *Our Number Workshop 1* can be used with page 47.

Charting the Course

Some of the component subgroups of the numbers 8, 9, and 10 have been introduced in previous pages. Thus 8 as the double of 4 (or as 4, 4) was introduced on page 21, and 9 as 8, 1 was emphasized on page 26. Up to this point the number 8 as 5, 3 has not been given any special attention. Similarly, several of the component groups of the numbers 9 and 10 have not as yet been introduced. Pages 48-55 and the activities described are designed to complete the introduction of all sets of component groups of the numbers up to and including 10. As has been noted previously, these experiences lead to readiness for the addition and subtraction facts. Thus the program of *Numbers We See* leads to readiness for later learning of the 45 non-zero addition facts whose sums are 10 or less, and the corresponding set of 45 subtraction facts.¹ It should be remembered that at this stage of his development the child is not taught to verbalize the basic facts, that is, to say them in words, nor to symbolize them, that is, to write or identify them in the form of figures. He should, however, be ready to continue in subsequent grades toward this goal with understanding of what is expected.

48 — 49 Component groups of 8

KNOWING YOUR OBJECTIVE FOR PAGES 48-49

These pages develop the meaning of 8 as made up of the subgroups 2, 3, 3, which, when combined, show 8 as 6, 2; as 5, 3; and as 7, 1. These pages focus attention on the rearrangement of the subgroups of 8 and complete the introduction of 8 by presenting the sets of larger subgroups from which 8 is derived by combining.

PREPARING FOR PAGES 48-49

Have on hand, if possible, "The Race" in *Sally Does It* (item 38 in the bibliography).

¹ Readiness for some of the multiplication and division facts has also been included.

Have available for each child a quantity of markers (buttons, little sticks, checkers, etc.). There should be more than 28 markers for each child.

Pictures 18, 19, 21-25, and 72-79 from *Arithmetic Readiness Cards Set 1* can be used, or the groups for 8 (7, 1; 6, 2; 5, 3; 4, 4) can be added to the set you made. (See pages 139-140.)

Have at hand several sheets of oaktag (24" x 36") on which the children can paste pictures or parquetry papers. Provide a supply of gummed parquetry papers.

Provide for each child a sheet of plain paper or drawing paper folded or ruled into eight sections.

INTRODUCING PAGES 48-49

If time permits, read "The Race" to the group. Ask the children if any of them ever has been in

a tricycle race. After a short discussion of tricycles and races show the children page 48 and let them open their books to that page.

Tell the children that these pictures show Don and his friends having a "bike" race.

USING PAGES 48-49

Ask the children to look at the picture at the left side of page 48. "Count the boys in this picture. Find the big group that is ahead. How many boys are in this group? How do you know that there are 6 boys in this group without counting them? [groups of 3, 3] How many boys are in the group that is behind? These two groups make a group of 8."

Let the children arrange chairs in this same way. Let 4 boys and 4 girls sit in them.

Before going on to the work with the picture on the right side of page 48 be sure the children realize that the 8 is made up of a group of 6 and a group of 2.

Now direct the children's attention to the boys in the other picture on page 48. Proceed with this picture in the same way as explained for the other picture. Let the children discover that the whole front row in the first picture has joined the two boys who were behind. Have the children rearrange the chairs previously used to show this new grouping.

Give each child more than 10 or 12 markers. Now tell the children to show with their markers the arrangement of 8 as shown in the first picture. Tell them not to count out 8 markers, but to decide when they have 8 by the arrangement. Then have them rearrange their markers to show the arrangement of boys in the second picture.

Finally let them rearrange the markers to show other groupings of 8.

Now have the children look at the pictures on page 49.

Point to the picture of the red tricycles and ask the children, "How many red tricycles are there in this box? Do you think the tricycles are being arranged as the ones are in the last picture? Should we put the yellow tricycles or the blue ones with the red tricycles to make this group of 8? Where would you put the yellow tricycles?" Let one child go to the blackboard and show the correct position by drawing X's.

Proceed with each of the other pictures in this way. For the groups 4, 4; 3, 5; and 7, 1 ask, "Which wagons [trucks, airplanes, engines, racers] should we put with these to make a group of 8?"

As a final part of the work with this page let the children take turns arranging "pictures" of 8 from a group of small objects thrown on a table in random fashion by you. The child should decide upon the arrangement (4, 4; 5, 3; 6, 2; 7, 1). Give much practice in this and continue it for 8 along with the work for the other numbers on the following pages.

Finally get the children to "see," without rearranging them manually, the "pictures" in groups of 5, 6, 7, or 8 objects thrown on the table. Discourage counting and emphasize recognition of the quantity by the groups. As time goes on control the time during which the child sees the group of objects by covering or screening them with paper or cardboard. Eventually control the time so that he cannot count the objects. Work individually

with the children. When you are working with one child, let the others in the group stand by to watch. Let them verify or correct each response.

APPLYING THE NEW CONCEPTS AND SKILLS

Give as much experience as time permits in arranging and rearranging 8 objects from supplies in excess of 8.

Let the children paste (on the oaktag charts prepared earlier) pictures that show the groups that form 8.

The children may be given gummed parquetry papers and directed to paste them on the large sheets of oaktag in arrangements of 8.

Give each child a work sheet divided into 8 sections. Give directions like the following: "In the first box draw 8 boats. Make them in whatever picture [arrangement] you wish. Now draw kites in the next box. Make a different picture of 8. Draw pictures in each of the other boxes. Make as many different pictures of 8 as you can."

Use the *Arithmetic Readiness Cards Set 1* (or the ones you made). Begin with the cards that show the organized groups and end with cards that show unorganized or random groups. Do not allow enough time to count the objects.

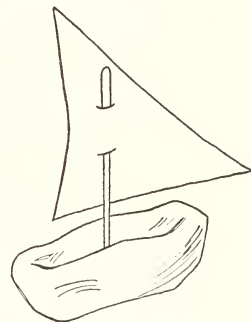
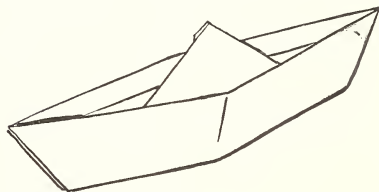
Worksheets 63, 64, and 65 of *Our Number Workshop 1* can be used with pages 48-49.

show 9 as 5, 4; as 6, 3; and as 7, 2. These pages focus attention on the rearrangement of the subgroups of 9 and complete the introduction of 9 by presenting the sets of larger subgroups from which 9 is derived by combining.

PREPARING FOR PAGES 50-51

Have on hand if possible *The Boats on the River* (item 5 in the bibliography) to read or tell to the children.

Prepare or have the children help prepare about a dozen paper boats or about a dozen clay boats



50 - 51 Component groups of 9

KNOWING YOUR OBJECTIVE FOR PAGES 50-51

These pages develop the meaning of 9 as made up of the subgroups 2, 3, 4, which, when combined,

with triangular paper sails attached with toothpicks. Little boats can be made of oaktag and placed in half corks as described earlier. Simple markers may be used instead of boats.

Have available for the children a large chart (on oaktag 24" x 36") on which objects have been drawn in groups of 2, 3, 4, 5, 6, 7, which can be combined as subgroups of 9.

Have available a supply of transparent paper, cut to cover page 51.

Pictures 26-40 and 80-94 from *Arithmetic Readiness Cards Set 1* can be used. If you are making your own, add the groups for 9 (8, 1; 7, 2; 6, 3; 5, 4). [See pages 139-140.]

INTRODUCING PAGES 50-51

Read (or let the children look at the pictures in) *The Boats on the River*. After a discussion of boats show the children page 50 in your book and have them open their books to the same page.

Explain to the children that, after their tricycle race, Don and some of his friends decided to sail their boats. Ask them what they think Don is doing with the stick.

USING PAGES 50-51

Have the children look at the picture on the left side of page 50. Ask questions somewhat as follows: "Which boats in the first picture have the best chance of winning the race? Which have the poorest chance? How many boats are in the pond in the first picture? Bob, how many boats are in the front row? [Show them the 2 boats in the front row.] What color are they? How many boats are in the middle row? How many boats are in the back row? Now, Linda, point to each row and tell

me how many boats are in each row as you point to it. How many boats are there in all?"

Point out that it is easy to see the group of 2 in the front row, the group of 3 in the middle row, and the group of 4 in the last row. The objective is to get the children to recognize this arrangement as 9.

"Now, John, how many boats are in front of the stick Don is holding? How many boats are in back of the stick? How many boats in all are in the pond in the first picture? These two groups make a group of 9."

Give each child about a dozen boats made of paper (or modelling clay). Direct the children to arrange them in the same way as the boats in the first picture. Discourage counting. Try to get them to know 9 as a row of 2, a row of 3, and a row of 4, to realize that when this arrangement has been made they have 9 objects. Some of the children may be permitted to show this arrangement of 9 with X's on the blackboard.

Now direct the attention of the children to the middle picture on page 50. Ask: "How many boats are in the pool? How many are behind the stick? How many boats are in front of the stick? How do you know without counting that there are 6 boats in front of the stick?" They should recognize the pyramid arrangement of 6 shown on page 42. Again point out that this is another easy way to see the arrangement of 9 as 6, 3. Then direct the children to rearrange their boats (or markers) to show the arrangement in this picture.

Direct attention to the last picture on page 50. Let the children tell how many boats are in this

picture. Then proceed with the same activities as described above for the other two pictures. Be sure the children understand that this is an arrangement of 9 as 7, 2.

After the work has been finished for page 50 have the children look at page 51 and proceed somewhat as follows: "Look at the red boats in the white box at the top of the page. How many red boats are there in the white box? We want a group of 9 boats. There are more boats below the red ones. Should we put the yellow boats or the blue boats with the red ones? How do you think we should arrange them? [Be sure the children look at the correct boxes.] Where should we put them?" This can be done with markers.

Let one child go to the blackboard and show the above arrangements by drawing boats or X's.

Proceed in this manner with each of the other 7 sets of pictures. In each case call the children's attention to the group in the large box and have them find the correct number of boats in one of the smaller boxes beneath it. Let the children decide where to place the second group.

When the work with page 51 has been completed, let the children take turns arranging "pictures" of 9 from a group of small objects thrown on a table (or the floor) in random fashion. The child should decide upon the arrangement (2, 3, 4; 6, 3; 7, 2; 5, 4; 8, 1; 3, 3, 3). Occasionally throw 8 objects instead of 9. Let the child discover this while he is arranging the objects. He should then make a "picture" of 8.

Finally lead the children to "see," without rearranging manually, the "pictures" in groups of

3, 4, 5, 6, 7, 8, or 9 objects thrown in random fashion on the table. Discourage counting and emphasize recognition of the quantity by "seeing" the groups. The child can be prevented from counting by covering or screening the objects with a piece of paper or cardboard before he has had time to count. As you work with one child let the others stand by to verify or correct the responses.

APPLYING THE NEW CONCEPTS AND SKILLS

Have the children arrange the markers, little paper boats, or the clay boats in groups as pictured in the book.

Let each child go to the large chart with pictures of objects in groups of 2, 3, 4, 5, 6, and 7 and select the pictures that he would put together to form a group of 9. Let each child have a turn.

Distribute to each child a piece of transparent paper to place over page 51 in his book. Have the children mark with a red X the group in the small box that will be needed to complete the group in the white box above it to make 9. Continue in the same manner with different colors for all the white boxes on the page.

Use the readiness cards described previously.

Worksheets 66, 67, and 68 of *Our Number Workshop 1* can be used with pages 50-51.

52 — 53 Component groups of 10

KNOWING YOUR OBJECTIVE FOR PAGES 52-53

These pages develop the meaning of 10 as made up of the subgroups 1, 2, 3, 4, which, when combined, show 10 as 9, 1; as 8, 2; as 7, 3; as 6, 4;

and as 5, 5. These pages focus attention on the rearrangement of the subgroups of 10 and complete the introduction of 10 by presenting the sets of larger subgroups from which 10 is derived by combining.

PREPARING FOR PAGES 52-53

Have available "My Kite" or "My Kite Game" in *Poems for Playtime* (item 35 in bibliography) or "The Kite" in *The Magic Stairway* (item 25).

Provide each child with about one dozen markers. Small cardboard kites may be used.

Have a sheet of transparent paper for each child. The papers should be cut to cover page 53.

Prepare for each child a sheet of paper ruled or folded into eight sections.

Pictures 41, 42, 44-54, and 95-108 from *Arithmetic Readiness Cards Set 1* can be used. If you are making the cards, add the groups for 10 (9, 1; 8, 2; 7, 3; 6, 4; 5, 5).

INTRODUCING PAGES 52-53

Read or tell one or more of the poems listed above. Then encourage the children to talk about kites and their experiences with them. If possible, have a few kites on hand to show the children. Show page 52 to the children and ask them to turn to this page.

USING PAGES 52-53

Tell the children to look at the picture at the left side of page 52. Let them speculate about where the other boys are. Ask such questions as: "Which kite is highest in the sky? Count the kites in this picture. What color are the kites in the bottom row? How many red kites are in this row? How many blue kites are in the next row? How

many kites are in Row 3? How many kites are at the top? Find the row of 1 kite. The row of 2 kites. The row of 3 kites. The row of 4 kites. When the kites are arranged this way we know without counting that there are 10."

"John, show us on the blackboard how the kites are arranged. Now all of us will arrange our kites [markers] to show this picture of 10. Don't count the markers."

Now let the children see the groups 4, 5, 1 in this picture. Direct their attention to the 4 red kites, the 5 blue kites, and the 1 red kite. Then show the children how to see a group of 7 by covering the top 3 kites, a group of 9 by covering the top kite, and a group of 6 by covering the bottom 4 kites.

Call attention to the other picture on page 52. First emphasize the groups of 5 (5 blue and 5 red kites) by having them cover one group, then the other. Let them make this arrangement by rearranging their kite markers.

Now have the children look at the pictures on page 53. Show them the red kites and the groups of green and blue kites beneath the red ones. Tell them to look at the red kites and ask: "How do you know that there are not 10 red kites? Should we use the kites in the yellow box or in the red box to finish the picture of 10 kites? Show with your markers where you would put it."

"Look at the yellow kites in the next box. How many are there? There should be 10 kites. Shall we use the blue kites or the red kites to complete our picture? [Be sure the children look at the boxes between the heavy black lines.] Show with your

markers on your desks where you would put these kites."

Continue in this way with the other six pictures.

Next let the children take turns arranging "pictures" of 10 from a group of small objects thrown on a table (or the floor) in random fashion by you. The child should decide upon the arrangement. Occasionally throw 6, 7, 8, or 9 objects instead of 10. Let the child discover by his arrangement that there are not 10, and let him show by grouping how many there are.

Finally get the children to "see," without rearranging manually, the "pictures" in groups of 5, 6, 7, 8, 9, or 10 objects thrown on the table. Discourage counting and emphasize recognition of the quantity by the groups. Control the time during which the child sees the group of objects by covering or screening them with paper or cardboard. Eventually control the time so that he cannot count the objects. Work individually with the children. Let the other children stand by to watch, to verify, or to correct each response.

APPLYING THE NEW CONCEPTS AND SKILLS

Give as much experience as possible in making with markers groups of 5, 6, 7, 8, 9, or 10 as directed. Check the work of each child.

Give the children work sheets folded or ruled into eight sections. Tell them to make groups of 10, one group in each box. Tell them to make as many different pictures as they can. Suggest that they draw circles, apples, cats, etc.

Show each child how to cover page 53 with transparent paper. Then tell him to make a big circle on the kites that are needed to finish the

picture of 10 in each of the eight white boxes.

Use the readiness cards previously described. During the remainder of the school year, these cards should be used as frequently as possible.

Worksheets 69, 70, and 71 of *Our Number Workshop 1* can be used with pages 52-53.

54 — 55 Review of 6, 7, 8, 9, 10

KNOWING YOUR OBJECTIVE FOR PAGES 54-55

These pages present an opportunity for the child to react to the numbers 6, 7, 8, 9, and 10 through pictures of objects arranged to show the component groups.

PREPARING FOR PAGES 54-55

Have available for each child a frame (see pages 86-87) and some clamps (if necessary).

Use the pictures from the readiness cards that show the component groups for the numbers 6, 7, 8, 9, and 10.

Supply each child with about 20 markers, 10 of one color and 10 of another color.

Have available for each child two sheets of transparent paper cut to fit the pages in the book.

Provide modeling clay for each child.

INTRODUCING PAGES 54-55

Encourage the children to talk about the toys they have at home. Then say that they are going to see some toys that Don, Carol, Nancy, and their friends play with.

USING PAGES 54-55

First see that each child has the frame correctly placed on page 54 with the star at the top to show groups of 6 and 7 only.

"What do you see in the first picture at the top of the page? Tell us, Sharon. How many do you see? How would you know there are 7 bears without counting them? Arrange some red [or other color] markers the way the bears are arranged. Try to do this without counting." If there is space on their desks, request the pupils to keep the 7 red markers in this arrangement until later.

Proceed in the same way with the next picture (hats). Tell them to arrange some blue (or other color) markers the way the hats are arranged and to keep them this way until later.

Continue in this way with each picture. Let the children rearrange the 6 blue or 7 red markers for each picture.

Now have the frame turned so that the circle is at the top. In this position the frame shows pictures of 8 and 9 objects only. Proceed exactly as described for the groups of 6 and 7.

Next place the frame with the circle (and later the star) at the bottom. Let the children take turns telling what they see: "7 bears, 6 hats," etc.

Proceed with page 55 in the same way as explained for page 54. First place the frame with the star at the top. In this position the frame shows groups of 10 only. Let them rearrange markers to show the groupings. Then place the frame with the circle at the top. In this position the pictures show both 8 and 9. When the star and circle are at the bottom, groups of 8, 9, and 10 are seen.

APPLYING THE NEW CONCEPTS AND SKILLS

Show the children how to place transparent paper over pages 54-55. Then give them such directions as: "Put a red X on each picture that shows

7. Put a blue X on each picture that shows 8."

Use *Arithmetic Readiness Cards Set 1* (or your own cards) now and frequently throughout the re-

mainder of the school year.

Worksheets 72 and 73 of *Our Number Workshop 1* can be used with pages 54-55.

Charting the Course

Understanding of the numbers above 10, and in fact of the fundamental operations with numbers, depends upon a knowledge of the principles of the decimal system. The fundamental idea of the decimal system is *grouping by tens*. This idea is involved in the words we use to express numbers. Thus *forty-seven* is a short way of saying "four tens and seven." In order to understand our written notation, we must also know the principles of place value. In written number symbols like 47, the number written at the left indicates how many groups of ten and the number written at the right indicates how many ones are contained in the number. Thus 47 means "4 groups of ten and 7 ones." Readiness for the use of numbers above ten, therefore, depends upon knowledge of these principles. In particular, readiness for *counting to 100* requires careful presentation of the idea of grouping by tens, and of stating subsequently the number of such groups plus the number of additional ones. Readiness for reading and writing of the numbers calls for presentation of the idea of recording the results of counting by assigning different places to the number indicating "tens" and the number indicating "ones." Pages 56-63 of *Numbers We See*, and the related activities which are described for those pages, are designed to help teachers develop these understandings.

The pictures on pages 56-59 show groups of ten and may be used to teach the children how to count to one hundred by tens. Each of the numbers 20, 30, 40, 50, 60, 70, 80, 90, and 100 is represented in a separate picture.

On pages 60 and 61 numbers within the various decades (for example, 34) are represented pictorially, and at the same time it is shown how the results of counting (by tens and then ones) may be recorded by tallying in two columns. Care has been taken to provide a place at the left for the tally marks indicating tens and a place at the right for those indicating ones. Finally, on pages 62 and 63, written number symbols are introduced to replace the tally marks. It is not necessary to include this work on the number system in the program for the slower children in Grade 1. *Numbers in Action*, the book for the next grade, does a complete reteaching and development of these same concepts.

56 - 59 The decades to 100

KNOWING YOUR OBJECTIVE FOR PAGES 56-59

These pages introduce grouping by tens. The child learns to think of the decade as a large group and how to count by tens to 100. It is not necessary to include this work on the number system in the program for the slower children in Grade 1. *Numbers in Action*, the book for the next grade, does a complete reteaching and development of these same concepts.

PREPARING FOR PAGES 56-59

Have available such objects as peg sticks, pencils, small artificial logs, boxes, cans, or spools that can be made into piles or bundles of ten.

Prepare for each child a work sheet divided into about twelve sections. In each section draw a different number of bundles or piles, each containing 10 objects. Be sure to include each decade from 10 to 100.

Provide each child with 10 markers.

If *Arithmetic Readiness Cards Set 2: Number System*¹ is available, Pictures 1, 11, 16, 28, 33, 46, 55, 60, 79, and 96 can be used. Directions for using the cards are given in the *Teacher's Guidebook* included in each set.

INTRODUCING PAGES 56-59

Ask the children if any of them have ever built a toy house. If any of them have, let them talk about it. Then show them some pictures of different kinds of simple houses, including log cabins. Ask

¹ *Arithmetic Readiness Cards Set 2: Number System*, by Maurice L. Hartung, Henry Van Engen and Helen Palmer. Scott, Foresman and Company.

if any of them have read about people who lived in log cabins, and if they have seen a log cabin. Ask them if they have ever seen or visited a summer camp. Explain that Don has a toy building set and that he is building a camp with cabins with log roofs. Show them page 56 and tell them to turn to that page.

USING PAGES 56-59

Begin by asking such questions as: "How many houses has Don started to build? What part of each house has he not made as yet? What do you think the two piles of logs are for? [Direct the children's attention to the two piles of logs in front of the houses and let them decide that he is going to use them for the roofs.] Why do you think he has put them in piles? [One pile for each house.] How many logs are in each pile?"

Let the children discover that there are 10 logs in each pile. Then direct their attention to the way the logs are piled. Emphasize the 1, 2, 3, 4 arrangement. Let them look at the kites in the first picture on page 52 for a review of this arrangement. Also, if possible, let them make piles of boxes, cans, blocks, etc., in this arrangement. The objective is to get them to accept this arrangement as 10 without counting when it is used on the five pages that follow.

Continue somewhat as follows: "How many logs are in this pile [point to the pile on the left]? How many logs are in this pile [point to the pile on the right]? We have 10 logs here and 10 logs there. There is a new word that we can use when we count these logs." Show them how to say "ten" for the pile on the left and "twenty" for the pile on

the right. Be sure to complete the counting "ten, twenty." Explain that we can say "twenty" only when the pile counted after "ten" has 10 logs in it. Ask, "Does Don have enough logs for the roofs?"

Build (or let the children build) two piles of blocks (or other objects) in the pyramid arrangement. Let them count them as "ten, twenty." Then remove (or conceal) the pile on the left. Point to this pile and say "ten." Show both piles again and let the children count them. Conceal one pile and get them to say "ten" for whichever pile of blocks remains. The objective is to develop the idea that "ten" and "twenty" are not the names of piles, but are words that tell how many objects have been counted. They may count "one pile or ten logs, two piles or twenty logs," etc. Continue by having the children count the piles as "ten, twenty" from the right.

Now show them both piles of blocks (or other objects) and let them count "ten, twenty." Then remove 1 block from the second pile. Tell the children that they can say "ten" for the first pile, but cannot say "twenty" for the second pile. Be sure they understand that they cannot because the second pile does not have ten objects in it.

Give each child a quantity of objects and tell him to put twenty of them on his desk. "How many will we put in each pile, Joe? How many piles will we have?" Let the children verify one another's work. Twenty should be arrived at by making two groups of 10 each.

Proceed in a similar manner with the second picture on page 56 and with each of the pictures on pages 57, 58, and 59. First (with each picture)

let the children decide that there are 10 logs in each pile. Then show them how to count by tens, introducing the new decade word needed for that picture. Emphasize the expression "one hundred" for the work with the last picture. Let them count the logs in both directions and in a mixed-up order. To count in a mixed order, let each child put a marker on a pile as he counts it. At the end of the work with each picture, let the children decide whether or not Don has enough logs.

Finally, use objects, as explained for the first picture on page 56. Conceal one or more piles and let the children count those that remain. Conceal different piles to reinforce the idea that the decade words are *not* names of piles but words that tell "how many." Also remove some objects from one or more piles to test the children's comprehension of the fact that they cannot count such a pile as a ten. When the work is begun with page 58, tell the children that Don has begun to build more houses and is laying out logs for the roofs. Let the children match a pile of logs to a house at the beginning of each picture.

The work with these four pages should take at least one week. A great amount of varied practice must be given. The counting should be related to objects. The final practice can be with boxes (or other closed containers) which the children accept as containing ten pencils, ten erasers, or other objects (the same kind of objects in all boxes).

APPLYING THE NEW CONCEPTS AND SKILLS

Give each child a copy of the work sheet described in "Preparing for Pages 56-59." Direct the children to put a distinctive mark on the pictures

that contain the number of objects you designate. For example, "Put a red X on the picture [or pictures] that show thirty. Put a blue circle on the picture [or pictures] that show fifty."

Worksheets 74 and 75 of *Our Number Workshop 1* can be used with pages 56-59.

60 - 61 Tens and ones

KNOWING YOUR OBJECTIVE FOR PAGES 60-61

On these pages the child becomes acquainted with the meaning of the numbers within the decades and learns to refer to groups made up of ones and tens. He also is introduced to the idea of representing ones and tens by symbols and to the distinction between symbols representing ones and symbols representing tens by their positions.

PREPARING FOR PAGES 60-61

Any of the pictures from *Arithmetic Readiness Cards Set 2* showing the numbers from 11 to 100 can be used.

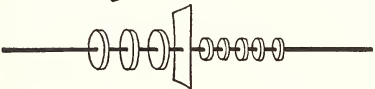
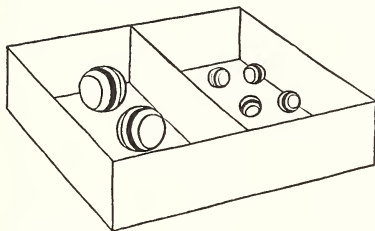
Chart 14 of the *Number Readiness Chart* will also be useful.

The supply of objects (sticks, cans, blocks, etc.) used in connection with pages 56-59 can be used with these two pages.

Prepare one or more charts (on oaktag 24" x 36") divided into 8 sections. In each section draw or paste pictures of objects. Arrange the objects in groups, piles, or bundles of 10 each with additional sets of 1 to 9 single objects. Prepare for each child a work sheet (or work sheets) similarly divided into sections each of which is divided

into two columns like those in the pictures on pages 60-61.

Have on hand a box divided into two compartments and 10 large and 10 small marbles or balls made of modeling clay. See the picture below. A rod on which disks of cardboard can be slid like that pictured below, may be useful, also.



INTRODUCING PAGES 60-61

Use Chart 14 of the *Number Readiness Chart* if it is available. Follow the plan outlined in *Developing Number Readiness*. Be sure to develop the number words from 11 to 19 when using this chart.

Tell the children that Don and one of his friends decided to count the logs that they had left over after building the ten houses. Then show page 60 to the children and tell them to find that page in their books.

USING PAGES 60-61

Encourage the children to talk about what the two boys are doing. Let them decide that Don is

putting the logs in piles. "How many is he putting in the pile? How do you know? [Compliment the children if they refer to the "1, 2, 3, 4," arrangement.] How many logs does he have left over? What is Don's friend doing? [Try to get them to decide for themselves that he is making a record of the logs.] Why do you suppose he has put one mark to the left of the line on his paper? [Work for answers that show they understand that this mark is for the pile of 10 logs.] Why do you suppose he put the three marks to the right of the line on his paper? [To represent the ones.] Do you see that Don has divided his paper so that he can put the marks for piles of ten on the left side and the marks for ones on the right side? Why do you think he wanted to keep these marks separate?"

"Now look at the top picture at the right. How many piles of logs has Don made? How do you know that there are 10 logs in each pile? Which marks did his friend make for these piles? Did he make a mark for each pile? Why did he make the marks to the right of the line on the paper? [For the logs that are not in piles.] Did he make a mark for each log? How many marks did he make? Let's count the logs." Show the children how to count the piles of 10 first as "ten, twenty, thirty." Then show how to count the single logs "thirty-one, thirty-two, thirty-three, thirty-four." Let them take turns doing this. Be sure each child points to the pile of logs or the log he is counting. Next let them take turns counting the tally marks in the picture in the same way.

Proceed in exactly this way with the other three pictures on page 60.

Now place on a table before the group 16 (or 14, 19, etc.) objects in a disorganized pile. Direct one child to make a pile of 10 and to put the others in a row beside the pile. Let the child count the objects by saying "ten" for the pile and "ten and one or eleven," "ten and two or twelve," etc., for the pile and the single objects. After each counting, put down (or pick up) one or more of the single objects, and let another child count the remaining objects, "ten, eleven," etc. Continue this activity until all of the children can perform satisfactorily with the "teens."

The children may use the box and marbles or the rod and disks of paper to tally tens and ones to give variety to the activities.

Add to the objects a random number of additional objects (6, 8, 9, etc.); then direct a child to make piles of 10. Let him count as before. Continue to vary the number of single objects until all numbers within the decade are included. Do this for as many of the decades as possible.

Give each child a supply of sticks (or other objects that can be conveniently bundled) and some rubber bands (or boxes in which to put the objects). Let him arrange them in tens and report to you how many he has. The practice can be extended by removing sticks or adding to his sticks after each successful performance.

Occasionally, during the various activities, openly remove 1 or 2 objects from an established pile or bundle of 10. Then see if the children know that that pile or bundle must not be counted as 10.

In each of the pictures on page 61, let the children count the logs. Then let them match the

tally marks on both white and yellow papers to piles of logs and to single logs. Finally let them count by tens and ones as they point to the tally marks on the correct paper.

Before proceeding to the next two pages, give the children practice in counting from 1 to 100 by ones. Let them count objects one by one beginning at any designated point. For example, give John a box that is closed tightly and a pile of stones. Say, "John, I want to have one hundred stones in this box before I put it away. I have put 70 into it. Please put enough more into it to make one hundred." Show him how to begin counting at 71. Let one child begin to count papers, pencils, etc.; then at some point let another child continue, and so on. From time to time throughout the year continue this work until each child can successfully count to 100. Give frequent practice in grouping by 10 and counting by decades.

APPLYING THE NEW CONCEPTS AND SKILLS

Provide each child with the work sheet described at the beginning of the notes for these pages, and place the chart, described previously, before the children. Tell each child to make tally marks in the proper section for each picture on the chart. "Make a line at the left side for each ten and a line at the right for each one."

For additional practice, let each child count the objects on the chart by tens and ones.

Worksheets 76 and 77 of *Our Number Workshop* 1 can be used with pages 60 and 61.

62 - 63 Number symbols to 100

KNOWING YOUR OBJECTIVE FOR PAGES 62-63

On these pages the child learns, through his knowledge of tens and ones, the meaning of the tens' and ones' digits in the numbers from 11 to 100. He also learns to identify and read these numbers. Many of the children will also learn how to write the numbers.

PREPARING FOR PAGES 62-63

Provide each child with two sets of the same kind of markers numbered from 1 to 9 and 0. Each child should have two markers with "1" on them, two with "2" on them, etc. Be sure the numbers are written in the form the children will write them later.

Continue to use the supply of objects that was used for pages 56-61.

If the children are to be taught how to write the figures (1 to 9 and 0), prepare a chart which shows how to make these figures. See the illustration at the bottom of this page for a suggestion

on how to make the figures. The dots show where the child begins to write the figure.

Prepare a work sheet with each figure in a row with the "starting" dots—a row of 1's, a row of 2's, etc.—and a row of two of all the figures. Make the figures large enough for tracing over by the children.

Any of the pictures from *Arithmetic Readiness Cards Set 2* showing the numbers from 11 to 100 can be used.

A set of cards (6" x 9") containing the numbers (in written form) from 1 to 99 will be useful.

INTRODUCING PAGES 62-63

Ask the children if they have ever played store. "What did you sell in your store? How did you arrange the things you sold? Tell me how the man at the grocery store arranges the boxes and cans. Does he pile them up? How? Does he put things into bundles, bags, or boxes?" Let the children discuss stores for a while; then tell them that Carol and a friend had a "play store" with lots of things to sell. Show them pages 62 and 63 and tell them to find these pages in their books.

USING PAGES 62-63

The work on these pages will require several consecutive days. At intervals thereafter the children should receive practice and additional work on these skills.

Direct the attention of the children to the first picture on page 62. Begin by asking: "How many boxes has Carol put in each pile? What is her friend [Mary] doing? Which marks did she make on the paper for the piles of boxes? Did she make one for each pile? Which marks did she make for

the single boxes [or the boxes not in the piles]? Did she make a mark for each of the boxes not in the piles?"

"Now, John, count the boxes. Count the piles by tens first. [He should count *ten, twenty, thirty, thirty-one*, etc.] Helen, count the marks that Mary made. Be sure to count the marks for the piles by tens." Give special attention and as much time as necessary to this procedure of counting the tallies. The objective is to get the children to understand that a mark may mean either 10 or 1, depending upon what it represents. The distinction between the marks that mean 10 and those that mean 1 is indicated by their position, just as it is in our decimal system of notation.

After the children have arrived at "35" as the number of boxes, as just explained, direct their attention to the numbers that Mary has written. Explain that Mary wrote "3" under the tally marks for the piles of ten because there were three marks and that she wrote "5" under the tally marks for the single boxes because there were five marks. "Each mark on the left of the line stands for a group of 10. So the 3 means 3 tens. When we count, we find that 3 tens are thirty. Each mark on the right of the line means 1. So the 5 means just 5."

Explain that Mary next wrote the figures beside one another; that the "3" she wrote at the left means 3 tens, or thirty; that the "5" she wrote at the right means just 5.

Now put before the group 35 objects that can be piled (or bundled). Let one or two children make piles of 10. Let another child make tally

marks on a piece of paper, as Mary did. Be sure that the paper has a line down the middle. Give each child a set of markers so that he has two markers for each of the numbers 1 to 9. Direct the children to arrange the markers on their desks to show the number 35. Check each child's work.

Proceed in this same way for each of the four pictures at the right side of page 62.

No attempt should be made at this point to teach the children how to write the numbers. Numbered tallies may be used with pages 62-63. After the work on these pages is well understood by the children, some teachers may wish to teach the children how to write numbers. For some children, however, it may be wise to defer the writing of numbers until Grade 2. Writing numbers will be a subject for much attention in the next grade.

The chart and work sheets described in "Preparing for Pages 62-63" can be used to advantage by teachers who plan to teach the writing of numbers. Let the children trace over the numbers. Be sure they begin each at the correct point.

Next direct attention to the pictures in the top row on page 63. For each picture have the children count the objects by tens and ones, match the tally marks and the objects shown, and count the tally marks by tens and ones. Then direct each child to put markers on his desk that show the number of objects. Ask the children to tell the color of the number printed in the book that shows how many objects there are. Ask one child to read the number. Let him explain why the other numbers are wrong. Give special attention to the number that is the reverse of the correct one.

For each of the other eight pictures on page 63, let the children select and read the correct number if they can. If they show an inability to do this, let them make tally marks on paper, as shown in the preceding pictures, and select the correct markers to assist in identifying the number.

As a final practice exercise, ask the children to tell how many objects are in designated pictures and to put on their desks in the proper position the markers that tell how many. For example, "How many logs are there? John, give us the answer. Let's all find the markers that we can use to make the number."

After the children learn to write the numbers (if this is taught), this page can be used by asking them to say the number for each picture, then to write the number.

Before leaving these pages, give the children practice in identifying the numbers from 1 to 99. The sight cards, described in "Preparing for Pages 62-63," can be used for this. Insist that the children not reply in unison but think the number. Then call on a specific child to say the number. This same practice can be given by writing the numbers on the blackboard. Always erase a number before writing another one. Be sure to write large, legible numbers.

Let the children find pages in their book by number. "Find page 14. John, tell us what you see on that page."

It may be advisable to show the children the number 100. But do not stress its formation at this point. If the children are curious, explain to them that the 10 at the left means 10 tens.

APPLYING THE NEW CONCEPTS AND SKILLS

Give each child a work sheet divided into a convenient number of sections, each containing bundles (piles, bags, etc.) of 10 objects each and some single objects. In each section write three or more numbers, one of which is correct for the number of objects and one which is the reverse of the correct number. Instruct the children to draw a circle around the correct number in each

section. After the children have learned to write the numbers, instruct them to copy the correct number in a space provided.

If the children are fairly proficient in recognizing numbers, call numbers to the children and have them arrange markers on their desks to show the numbers. Call a number, then check the work.

Worksheets 78, 79, and 80 of *Our Number Workshop 1* can be used with pages 62-63.

Charting the Course

When judged in terms of usefulness in daily life, the number ideas associated with money must be considered of fundamental importance. These ideas include, at the level of Grade One, not only the names of the smaller coins, such as one cent or "penny," five cents or "nickel," and ten cents or "dime," but also a knowledge of the relationships among them. Perhaps equally important are some notions of the values of the coins in terms of things they will buy. Thus a five-cent piece or "nickel" is not only equivalent to five pennies in the sense that, if a penny will buy one piece of candy, then a "nickel" will buy at least five pieces, but the nickel will also buy larger or more valuable things. The child who has a dime in his pocket, and who sees a ten-cent toy he would like, must know that the dime is the same as ten cents, but he should also have some idea of what things he can buy with his dime. Pages 64-66, and the activities suggested in these lesson notes, are planned to help teachers develop these ideas.

64 10 cents equal 1 dime

KNOWING YOUR OBJECTIVE FOR PAGE 64

This page assists in establishing the purchasing-value relationship between 10 cents and 1 dime. The child learns to handle coins and to think of

things coins will buy in terms of the relation among coins, instead of just memorizing the abstract relation as a fact.

PREPARING FOR PAGE 64

I Had a Penny (item 19 of the bibliography) can be read or told to the children if it is available.

Have available about 10 dimes and 100 pennies to use in connection with this page. There is no real substitute for the coins in teaching money relationships, because a considerable part of the ability to make change and handle cash is closely related to experience with the characteristics of the coins themselves—their feel, appearance, size, etc. If at all possible, have available for each child two dimes and ten pennies. Some of the children can bring the coins from home. Toy money can be used as a last (and poor) resource.

See the reference to a “play” store in “Applying the New Concepts and Skills.”

Have 20 pencils or other items to “sell.”

Supply each child with a set of markers. Include two markers for each number 1 to 9 and 0. Also include for each child two or three markers with the cents’ sign.

INTRODUCING PAGE 64

Read or tell the story *I Had a Penny*. Discuss with the children their experiences in going to the store and buying things. Show them the dimes and pennies and be sure they can identify them. Be sure the children understand that the words “penny” and “cent” are interchangeable. Do not discuss the relative values of the dime, nickel, and cent. Talk about the money they have for spending and for what they spend it. Then tell them Don and Carol are going to the store to buy candy sticks. Let the children find page 64 by number.

USING PAGE 64

Let the children talk about what Don and Carol are doing in the picture. Then proceed somewhat as follows: “How many sticks of candy has Don

bought? What coins is he giving the storeman to pay for the candy? How many pennies is he giving the man? [Try to get the children to see the ten without counting.] Did he give him a penny for each stick of candy?”

Let the children pretend to buy pencils (or other objects) at 1 cent each from you or a designated child. “How many pencils do you want, June?” “I’d like to buy 7 pencils.” “They are one cent apiece.” “Here is your money.” June gives 7 pennies and receives 7 pencils. Do this for various quantities of pencils from 4 or 5 to 20. Let the children take turns.

Now draw attention to Carol. “How many sticks of candy has she bought? What coin is she giving the storeman?” Explain that the storeman is satisfied because 1 dime buys as much as 10 pennies.

Let the children “buy” pencils, using dimes and pennies interchangeably.

Direct attention to the picture of the candy canes at the right side of the page. “Look at the way candy canes in the box are arranged. Who can tell me, without counting them, how many are in the box? All right, Mary, how many? How many in all are there in the picture?”

“Look at the row of pennies under the canes. Find a group of 10 pennies. How do you know there are 10 pennies? How many pennies in all are in the row? Is there a penny for each cane?”

Explain to the children that “12 pennies” means “12 cents.” Show them how 12 cents looks when it is written as a number. Explain that the cents’ sign means cents and that they should say “cents” when they read it. Connect the writing of 12 with

the work done for pages 62-63. Instruct each child to make 12¢ with his markers.

Now direct attention to the money in the green box. Explain to the children that a dime has been put in place of the group of 10 pennies. Tell them to count the money. Be sure they know that they can say “10 cents” when they count the dime. Recall the work with the piles of logs on the preceding pages. Prepare the children for this difficult idea that one thing represents 10 other things. This is the first situation in which the 10 single items are replaced by an equivalent single item. Tell them that the silver in the dime is nicer than the copper in the cent to explain the idea that more people want silver than copper.

“Show with your markers how much money you see in the green box. Is there enough to buy the candy canes? Count the money in the yellow box. Cover with paper the pennies you would take for a dime. Would you need all of this money to buy the canes?”

Show them how to count the money in the blue box by tens. They should learn to say “ten cents, twenty cents, twenty-one cents,” etc.

Proceed in the same way with the other three pictures on page 64. For each picture, let the children arrange coins on their desks and count the real coins.

Finally, give the children practice in counting money made up of dimes and pennies. For example, put 32 pennies in a pile on the table. Tell a child to make piles (stacks) of 10 pennies and to put the extra pennies in a row. Show him how to count “10¢, 20¢, 30¢, 31¢, 32¢.” Now let

him put a dime in place of one pile. Ask another child to count the money. Continue with different amounts of money and all possible situations involving dimes and pennies. Let the children show with numbered markers how much money there is. Lead the children into a discussion of the fact that some stores need many pennies while others do not have so much use for them.

APPLYING THE NEW CONCEPTS AND SKILLS

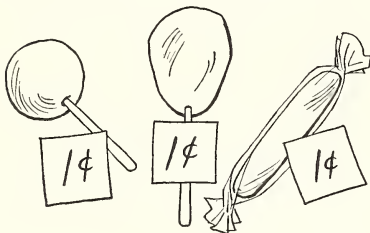
Set up a very simple play store. Use an orange crate and a few small objects to sell. Objects made of modeling clay such as shown in the picture below are very satisfactory. Provide pennies and dimes, if possible. See that the children practice the situations developed by page 64.

Worksheets 81 and 82 of *Our Number Workshop* 1 can be used with page 64.

65 Cent, nickel, dime

KNOWING YOUR OBJECTIVE FOR PAGE 65

This page assists in establishing the purchasing-value relationships between 5 cents and 1 nickel



and between 2 nickels and 1 dime. The child learns to handle the cent, nickel, and dime and to think of things these coins will buy in terms of the relation among the coins, instead of just memorizing as a fact the abstract relation among the coins.

PREPARING FOR PAGE 65

Bobbie Had a Nickel and *Five and Ten* (items 6 and 12 of the bibliography) will help introduce this page.

Have available from 50¢ to \$1.00 in each of pennies, nickels, and dimes. See remarks about use of coins in the notes for page 64 on page 155. Encourage those children who can to bring a few of each coin for their own use in connection with this work.

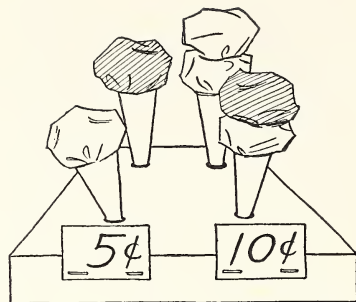
Continue the play store described in the notes for page 64.

Continue the use of the markers described in the notes for page 64.

Show the children how to make single- and double-“decker” (or “dip”) ice-cream cones of coils of paper and wads of white and colored tissue paper or facial tissues. See the picture above at the right.

INTRODUCING PAGE 65

Read or tell one (or both) of the stories mentioned above. Let the children talk about buying things at the store. Let them tell how they earn money. Show them a penny, a nickel, and a dime. Help them observe the differences in appearance and size. Then say: “Let’s see what Don and Carol bought with their money one day. Open your books to page 65.”



USING PAGE 65

Let the children discuss ice-cream cones. Be sure the distinction between single- and double-dip cones is clear. Draw attention to the price signs at the top of the picture. Let the children discover that a single-dip cone is 5¢ and a double-dip is 10¢.

Proceed by asking: “What kind of cones are Don and Carol buying? [Single-dip] How much does each cone cost? What coins is Carol giving the storeman? How many is she giving him? Is she paying him 5¢?”

“What coin is Don giving the storeman for his cone?” Explain that the storeman is satisfied because 1 nickel buys just as much as 5 pennies. “Which will buy more, a dime or a nickel?” Let the children discuss this and help them arrive at the correct conclusion.

Now direct attention to the picture at the right side of the page. “What kind of cones are Mary and Tom buying? [Double-dip] How much does

each cone cost? What coin is Mary giving the storeman for her cone? Is she paying him 10¢?"

"What coins is Tom giving the storeman for his cone? How many nickels is he giving the storeman? The storeman is satisfied because 2 nickels buy just as much as one dime."

Emphasize this fact by letting one child count out ten pennies, which he is to put in a stack. Then tell another child to put 10 pennies in another stack. Exchange one stack of ten pennies for a dime. Then exchange 5 pennies in the other stack for a nickel. Be sure the children understand that there are 10 cents in the stack. Show them how to count the nickel and 5 pennies, "5 cents, 6 cents, 7 cents," etc. Next exchange the other 5 pennies for a nickel. Help them see that there is still 10¢ in the stack and that the 2 nickels can be exchanged for a dime. Repeat this procedure until the children's observations and reactions show understanding of the relationships.

Let the children buy "ice-cream cones" (or other objects). See the picture to find out how to make cones of paper. Use pennies, nickels, and dimes in all the situations just described.

Direct attention to the first set of pictures of coins (white, yellow, and blue boxes) at the bottom of the page. "Count the money in the white box. Which box, the yellow one or the blue one, shows this same amount of money? What coin is in the blue box? How much money is that? [10¢] Which kind of cone can you buy with the money in the white box? With the money in the yellow box? With the money in the blue box? Would you have any money left?"

Proceed in this manner with the other two sets of pictures.

To develop the idea of making change, ask such questions as, "If you gave the storeman a dime for a single-dip cone, would he give you any money back? Would 5 pennies be all right? Would a nickel be all right?" Let the children act out such situations with the paper cones.

Finish with activities similar to those described in the last paragraph of "Using Page 64." See page 155. Include pennies, nickels, and dimes. Do not expect the children to count by fives. Show them how to combine nickels or nickels and pennies to make groups of 10¢, which can be counted by tens. Where one nickel is included with some pennies show the children how to count by beginning with "five," as "five cents, six cents, seven cents," etc. This is the only time that they should use a group of 5 in counting at this level. Of course, some of the children may be able to count by fives. Let them do so, but do not stress their skill or make others feel they should do it, too. This kind of counting should follow understanding, not precede it.

Give opportunity for the children to show with counters the various amounts of money. If they can write numbers, let them write the amounts. Be sure they can make the cents' sign.

APPLYING THE NEW CONCEPTS AND SKILLS

Use the play store described for page 64.

Provide all types of buying and selling situations involving the money relationships taught.

Worksheets 83 and 84 of *Our Number Worksheet 1* can be used with page 65.

66 Cent, nickel, dime

KNOWING YOUR OBJECTIVE FOR PAGE 66

This page gives the child experience in identifying correct amounts of money needed to purchase items with prices indicated. These experiences are here limited to small amounts of money, 24¢ or less, involving pennies, nickels, and dimes.

PREPARING FOR PAGE 66

"A Penny to Spend" in *Sally Does It* (item 38 of the bibliography) may be used to introduce this page.

Have available for each child a frame, described on pages 86 and 87. Also provide clamps or clips to fasten them to the pages for those children who need such help.

The set of markers, 2 for each number 1 to 9 and 0 and several with the cents' sign, used for pages 64 and 65, will be useful.

Provide pennies, nickels, and dimes.

The play store, described for page 64, can be used to advantage with this page. Toys may be included among the articles for "sale."

Make a chart on oaktag (24" x 36") by pasting on it pictures of objects (apples, cans of food, toys, etc.) that can be bought for 25¢ or less. Label each object with the price.

Give each child a small sheet of plain paper.

INTRODUCING PAGE 66

Read or tell the story "A Penny to Spend" or another story like it.

Ask such questions as: "If you had a penny to spend, what could you buy with it? What could

you buy with a nickel? What could you buy with a dime?" Let the children discuss these questions.

Tell the children to open their books to page 66 to see some things that Don, Carol, and Nancy bought.

USING PAGE 66

Tell the children to place the frames on the page so that the circle is at the top. In this position only the pictures of the coins are visible. Proceed as follows: "What coin is in the first picture? [cent or penny] What other word can you use for it? How much is it worth? [1 cent] Put this amount of money on the sheet of paper on your desk. What coin is in the other picture at the top of the page? How much is it worth? [5 cents] Put this amount of money in pennies on the sheet of paper. [Be sure the previously used amount is removed.] Now change these pennies for a coin that is worth just as much." Continue in this manner for the other six pictures. The children can show with the numbered markers how much money is in a picture.

Now have the children turn the frame so that the star is at the top. The only pictures visible are the objects with their prices. "Find something that you can buy for five cents. On the sheet of paper put coins that will buy the ice-cream cone." Some children will select 5 pennies and some will use a nickel. Use this situation to emphasize the equality in value. Use each picture in this way. Encourage a variety of responses (with coins) for each picture. Do not strive for a response of 3 nickels for 15¢ or 4 nickels for 20¢. If any child gives these responses, give him praise but do not call the attention of the less informed children to these relations.

The frame should next be used with the star and the circle at the bottom. In each of these positions objects and the corresponding amounts of money are visible. Tell the children to find the pictures that belong together, an object and the correct amount of money. The page can be used in this way without the frame as a final exercise.

Charting the Course

The final four pages of *Numbers We See* are devoted to a review of the various number-readiness concepts and abilities which have been presented in previous pages. They include chiefly additional experiences in recognizing numbers in terms of the subgroupings of which they are composed, and measurement ideas. If some of the children have difficulty with the pages, and time permits, they should turn back to the pages where the ideas were introduced. Some of the activities suggested in the lesson notes, which were not used in the first presentation, may now be found useful in reviewing these ideas.

These four pages may also be used for an evaluation, or inventory, of the degrees of readiness of the children up to this point. For a detailed evaluation, the teacher should have each child respond individually to the different ideas represented on these pages. However, for most purposes the judgment of the teacher derived from her observation of each child in small working groups will suffice. Ideally, these judgments should be recorded in summary form for the guidance of the teacher the following year or of the next teacher the child will have.

67 Review and inventory

KNOWING YOUR OBJECTIVE FOR PAGE 67

On this page the child reviews his experiences in reacting to ideas used for comparisons which are fundamental to measurement. He also reviews the use of the numbers 1 to 10 to show position.

APPLYING THE NEW CONCEPTS AND SKILLS

Place before the children the chart with pictures of objects and prices. Let the children take turns reading the prices and counting out the correct amounts of money.

Worksheet 85 of *Our Number Workshop 1* can be used with page 66.

PREPARING FOR PAGE 67

Give each child a set of 10 markers, numbered from 1 to 10. Also give him a stick or narrow piece of cardboard 2 inches long.

Have on hand a supply of modeling clay to make objects like those described in "Applying the New Concepts and Skills."

INTRODUCING PAGE 67

Let the children discuss the objects in the room with respect to size and relative size. Use directions and questions like the following: "Look around the room to see if you can find something that is big. [Let various children tell what they see.] Now find something that is little. Let's all stand up. Which one of you is tallest? Who is shortest? Find something that is long. Show me something that is short." Endeavor to get the children to react to as many as possible of the terms relating to size.

Direct the children to turn to page 67.

USING PAGE 67

Ask the children to look at the picture at the top of the page. After they have talked about what they see, ask: "Which animal is biggest? [elephant; develop idea of overall size, not just height] Which is smallest? Is the bush taller or shorter than the tree? Is the windmill taller or shorter than the building? Which is shortest, the flagpole, the building, or the windmill? What is just as tall as the giraffe?" Many similar questions can be asked.

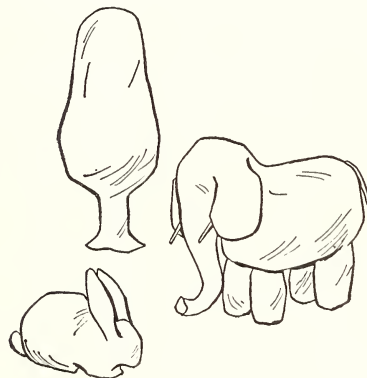
Let the children discuss the five pictures across the middle of the page. Then ask questions that require answers showing an understanding of such terms as *many*, *few*, *more*, *most*, *fewer*, *as many as*, *not as many as*, etc.

Now direct attention to the trains at the bottom of the page. Ask questions requiring the children to react to the terms *long*, *longer*, *longest*, *short*, *shorter*, *shortest*. Let them use a 2-inch stick or piece of cardboard to measure, if necessary.

Finally, return to the picture at the top of the page to review the positional meaning of 1 to 10. Proceed somewhat as follows: "Tell us what you see in this picture. Begin at the left. [Let two or three children do this.] Tell us, John, what is number 1 from the left in this picture? What is number 2, Helen?" Continue for all ten items. Then tell the children to put the markers on the things in the picture to show which is number 1, which is number 2, etc. Now do the same activities with these pictures beginning from the right.

APPLYING THE NEW CONCEPTS AND SKILLS

Give each child some modeling clay and give such directions as: "Make something that is long for a doll's house. Make something that is short for your desk. Make something that is tall for a doll's house." Put objects made by the group together on the table. Then ask the children to se-



lect the biggest thing, the smallest thing, the longest thing, etc. See the picture at the left below for objects that can be made of clay.

Worksheet 86 of *Our Number Workshop 1* can be used with page 67.

68 — 69 Review and inventory

KNOWING YOUR OBJECTIVE FOR PAGES 68-69

These pages present all the groups for the numbers 3 to 10 which the child has seen in this book and provide the means of reviewing and inventoring the child's knowledge of the groups. These pages also give a review of the use of numbers to locate a position with respect to two directions.

PREPARING FOR PAGES 68-69

Provide each child with one of the window devices, described on pages 101 and 103.

Provide each child with a set of markers labeled with the numbers 3 to 10. Give each child three markers for the numbers 3, 4, 5, and five markers for 6, 7, 8, 9, and 10.

Ask the children to bring pictures cut from magazines that show groups of 3 to 10.

The sight cards described in the lesson notes for pages 42-55 can be used to advantage with these pages.

INTRODUCING PAGES 68-69

Throw jacks (or other suitable objects), in varying number from 3 to 10, on a table (or the floor) in front of the group. Let the children take turns telling how many they see, without counting.

Direct those who cannot tell the quantities without counting to arrange the jacks to make a "picture" (grouping) that shows how many.

Tell the children that they will now see pictures of Don, Carol, and Nancy's toys.

USING PAGES 68-69

Let the children talk about the pictures on page 68. They show organized groups of 3 to 10.

Before using the windows, ask such questions as: "How many kittens are there in the first picture? Can you find any other pictures that show 3? How do you know that there are not 10 bunnies in Picture 2 in the top row? How many bunnies are there? Find another picture that shows 8. What do you see in that picture? How can you tell, without counting, that there are 8 hats [or bears or engines]?" Let the children discover all four pictures that show 8. Proceed in this way for the pictures that show 4, 5, 6, 7, 9, and 10.

Then go through the whole page rapidly, directing the children to look at the pictures in succession, beginning with the top row at the left. Tell the children to look at the picture and decide how many things it shows. Tell them not to count. Then call on a child to tell how many or direct each child to put on the picture a marker that tells how many. Check the work if the markers are used.

Ask the children to find Row 1 from the bottom. "What do you see in Row 2? [A simple answer from one child to identify the row is sufficient.] What do you see in Row 3? In Row 4? In Row 5? Now look at the first picture from the left in each row. John, tell us what one of these pictures shows. Helen, tell us what Picture 2 in one of the rows

shows. [Use 1, 2, 3, 4, 5, first, second, third, fourth, fifth, interchangeably.] Find Row 4, Picture 5. Mary, what does it show? [Insist on an answer that includes the name and number of the objects.] Find Row 3, Picture 2. Helen, what does it show?" Continue in this way for as many pictures as time permits.

Now see that each child has the window device properly fastened to page 68. Ask questions and give directions similar to those described in the paragraph above that require the children to open a designated window and to describe what they see. At the conclusion of the work the children can be directed to open two windows. Then, for example, ask such questions as: "Are there more trees than kittens? Is there a hat for each bear?" To make the page easy for the teacher to operate with the windows, a master window should be prepared by the teacher. This can be done by writing or drawing on each window a description of the objects in the picture.

Use page 69 on a subsequent day. Follow the procedures outlined for page 68. Page 69 shows groups of 3 to 10 in less organized form.

APPLYING THE NEW CONCEPTS AND SKILLS

Permit the children to discuss the pictures that they bring. Direct them to sort the pictures by the number of things they show. All pictures showing the same number of objects may be pasted on a large piece of otag or in a scrapbook. Each chart or scrapbook should be labeled with a number to indicate the groups (of 3, 4, 5, etc.) it shows.

Use the sight cards in the manner described in the lesson notes for pages 42-55.

The children should apply their knowledge of groupings in many situations. Talk with them about window displays, emphasizing the numbers of things that are brought together for the display. Let the children see how quickly and accurately they can form judgments of such groups.

Worksheets 87, 88, 89, and 90 of *Our Number Workshop 1* can be used with pages 68-69.

70 Review and inventory

KNOWING YOUR OBJECTIVE FOR PAGE 70

Page 70 gives the child an opportunity to review his experiences with measurement of length and volume.

PREPARING FOR PAGE 70

If possible, have on hand some small picture frames in which the backs have been securely fastened. A supply of pictures from magazines for framing will be needed. Frames can be made of otag or thin cardboard.

Provide some modeling clay for each child.

Provide each child with a stick exactly one and one-half inches long.

INTRODUCING PAGE 70

Give each child a piece of paper and tell him to draw a picture on it. The pieces of paper should vary in size, but several should fit the frames furnished by you. Let them talk about framing them. Tell them that, before they frame the pictures, they should see the pictures that Don and Carol drew. Direct the children to turn to page 70. Encourage them to use the page numbers.

USING PAGE 70

Direct attention to the picture frame at the top of the page. Let the children discover that the inside of the frame is just as wide and just as long as the sticks they have. Be sure that each child learns how to measure both ways with the stick.

Tell the children to measure with the sticks the picture of the house. "Can Don put it in the frame? Why not? [Be sure they understand that both dimensions must be correct.] Now measure the picture of the two children. Is this picture too large? Does it fit exactly? Measure the picture of the fruit. Will it go into the frame? [Yes] Why do you think it not a good fit?" Continue for the other two pictures.

Now tell the children to look at the picture of the blueberries. Help them see why it is difficult to know which pile has more berries in it. Develop the idea that if both piles were alike in height and "spread" the relative quantities could be judged more easily. Then tell the children to look at the pails into which the berries have been put. Be sure they understand that each pile has been put into a separate pail and that the pails are alike in size. Ask which pile of berries is the larger. Let them explain how they know.

In the pictures of the tomato juice, first let the children discover that the pitchers are different both in size and in shape. Be sure they observe that the bottom part of the larger pitcher is narrower than the bottom part of the smaller pitcher. "Does one cup hold the same amount of tomato juice as the other? How do you know? [Both are full. They are alike in shape and size.] Each cup

was poured into a different pitcher. Why does the tomato juice come up higher in the larger pitcher than in the other one? [The bottom is narrower.]"

Now direct attention to the bottles at the bottom of the page. Ask: "Which is the largest? [Bottle 1 or the first bottle on the left or the bottle with the red lid.] Which bottle is the smallest? [Bottle 6 or the bottle with the blue lid.] Which bottle do you think is larger, the one with the black lid or the one with the yellow lid? [Be sure the answer indicates knowledge of the impossibility of knowing because of differences in shape.] How do you know?"

APPLYING THE NEW CONCEPTS AND SKILLS

Let the children decide which pictures will fit the frames they have. The children can work in groups of two or three. Each group should have 2 or 3 frames and 7 or 8 pictures. Let them trim the pictures to fit the frames.

Let each child make two bowls with modeling clay. Designate one desk (or table) as the place where each child is to put his smaller bowl and another desk where he is to put his larger bowl. Be sure the group understands that one desk contains the collection of bowls made up of the ones judged smaller by the children who made them. Now let the group pick the largest bowl from among the small ones and the smallest bowl from among the large ones. The children will discover that a bowl that was the larger of two bowls may be smaller than the smaller of two other bowls.

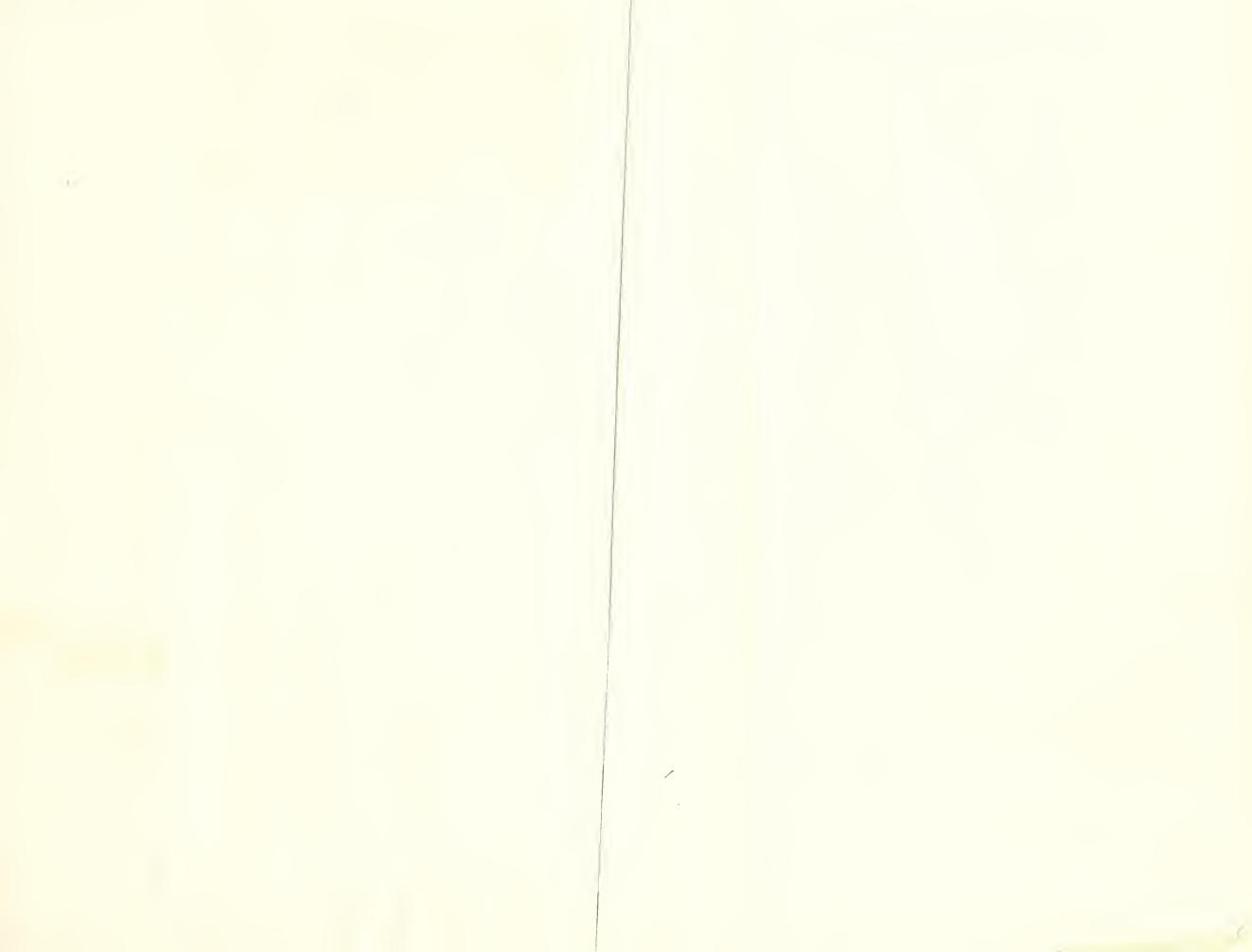
Worksheets 91, 92, and 93 of *Our Number Workshop 1* can be used with page 70. Worksheets 94, 95, and 96 can be used to review the number system, money, and grouping of numbers 1-10.

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The items listed below are referred to in the Lesson Notes and will be found useful in introducing the pages.

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- 2 **Angus and the Ducks**, told and pictured by Marjorie Flack. Doubleday, Doran, 1943
- 3 **Bear Twins**, by Inez Hogan. E. P. Dutton & Co., Inc., 1935
- 4 **Biggest Family in the Town, The**, by Helen Sterling, pictures by Vance Locke. David McKay Company, 1947
- 5 **Boats on the River, The**, by Marjorie Flack, pictures by Jay Hyde Barnum. The Viking Press, 1946
- 6 **Bobbie Had a Nickel**, by Frieda Friedman, pictures by Emmo. John Martin's House, Inc., 1946
- 7 **Chicken Little Count-to-Ten**, by Margaret Friskey, pictures by Katherine Evans. Childrens Press, Inc., 1946
- 8 **Come Meet the Clowns!** by Dorothy Neumann, illustrated by Lydia Furbush. The Macmillan Company, 1941
- 9 **Counting Rhymes**, Little Golden Book under supervision of Mary Reed, Ph. D., illustrated by Corinne Malvern. Simon and Schuster, 1946
- 10 **Everybody Has a House**, by Mary McBurney Green, pictures by Jeanne Bendick. William R. Scott, Inc., 1944

- 11 **First Nursery Stories**, illustrated by Florence Kent. Garden City Publishing Co., Inc., 1945
- 12 **Five and Ten**, by Roberta Whitehead, illustrated by Lois Lenski. Houghton Mifflin, 1943
- 13 **Flicka, Ricka, Dicka and the New Dotted Dresses**, by Maj Lindman. Albert Whitman & Company, 1939
- 14 **Fun With Michael**, by Dorothy and Margaret Bryan. Doubleday, Doran and Company, 1935
- 15 **Fun with Music**, by Mary Jarman Nelson, illustrated by Grace T. and Olive E. Barnett. Albert Whitman & Company, 1941
- 16 **Happy Birthday, Judy**, by Charlotte Becker. Chas. Scribner's Sons, 1942
- 17 **Happy Family, The**, by Nicole, illustrated by Gertrude Elliott. Simon and Schuster, 1947
- 18 **How Far?** by Marion V. Ridgway, illustrated by Helen Smith. David McKay Company, 1945
- 19 **I Had a Penny**, by Audrey Chalmers. The Viking Press, Inc., 1945
- 20 **I Like Trains**, by Catherine Woolley, pictures by Doris Spiegel. Harper & Brothers, 1944
- 21 **Little Auto, The**, by Lois Lenski. Oxford University Press, 1934
- 22 **Little Family, The**, by Lois Lenski. Doubleday, Doran & Co., Inc., 1932
- 23 **Little Red Hen, The**, A Little Golden Book, by Mary Reed, Ph. D., illustrated by Rudolf. Simon & Schuster, 1942
- 24 **Little Train, The**, by Lois Lenski. Oxford University Press, 1940
- 25 **Magic Stairway, The**, by Fredrika Shumway Smith, pictures by Fridolf Johnson. Alliance Book Corporation, 1942
- 26 **Make Way for Ducklings**, by Robert McCloskey. The Viking Press, 1941
- 27 **Millions of Cats**, by Wanda Gág. Coward-McCann, Inc., 1928
- 28 **Mother Goose**, by Tasha Tudor. Oxford University Press, 1944
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- 30 **New House in the Forest, The** by Lucy Sprague Mitchell, pictures by Eloise Wilkin. Simon and Schuster, 1946
- 31 **People Who Come to Our House**, by Clara Ingram Judson, pictures by Marjorie Peters. Rand McNally & Company, 1940
- 32 **People Who Work in the Country and in the City**, by Clara Ingram Judson, pictures by Keith Ward. Rand McNally & Company, 1943
- 33 **Physical Education for Elementary Schools**, by Neilson and Winifred Van Hagen. A. S. Barnes and Company, 1939
- 34 **Physical Training for the Elementary Schools** (Gymnastics, Games, and Rhythmic Plays), by Lydia Clark. Benj. H. Sanborn and Company, 1922
- 35 **Poems for Playtime**, by Carrie Rasmussen, illustrated by Eleanor J. Mathews. Expression Company, 1942
- 36 **Race between the Monkey and the Duck, The**, A Wonder Book, written and illustrated by Clement Hurd. Random House, Inc., 1940
- 37 **Rainbow Mother Goose, The**, edited (with an introduction) by May Lamberton Becker, illustrated by Lili Cassel. The World Publishing Company, 1947
- 38 **Sally Does It**, by Dorothy Walter Baruch and Elizabeth Rider Montgomery, illustrations by Robb Beebe. D. Appleton-Century Co., 1940
- 39 **Seven Diving Ducks**, by Margaret Friskey, pictures by Lucia Patton. David McKay Company, 1940
- 40 **Seven Little Elephants, The**, by William Hall, pictures by Fini. Thomas Y. Crowell, 1947
- 41 **Sing a Song of Safety**, record by Irving Caesar, music by Gerald Marks. Audio-Visual Division, Popular Science Publishing Co., 1946
- 42 **Sing a Song of Safety**, song by Irving Caesar, music by Gerald Marks, illustrated by Rose O'Neill. Published by Irving Caesar, 1947
- 43 **Snipp, Snapp, Snurr, and the Buttered Bread**, by Maj Lindman. Albert Whitman & Company, 1943
- 44 **Story about Ping, The**, by Marjorie Flack and Kurt Wiese. The Viking Press, 1933
- 45 **Surprise for Davy**, by Lois Lenski. Oxford University Press, 1947
- 46 **Unlike Twins in the Park, The**, by Charlotte Becker. Charles Scribner's Sons, 1944
- 47 **Very Young Verses**, selected by Barbara Peck Geismer and Antoinette Brown Suter, illustrated by Mildred Bronson. Houghton Mifflin Company, 1945
- 48 **Wait for William**, by Marjorie Flack. Houghton Mifflin Company, 1935
- 49 **When You're Watching a Parade**, Teach-O-Film-strip, Audio-Visual Division, Popular Science Publishing Co., Inc., 1946
- 50 **Where Are the Apples?** by Arthur Flory. Arco Publishing Co., 1945



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 Messner, Julian, Inc. The Copp Clark Publishing Co. Ltd., 517 Wellington St. W., Toronto 2B.
 Minton, Balch and Co. Longmans Canada Ltd., 20 Cranfield Rd., Toronto 16.

Oxford University Press. Oxford University Press, 480 University Ave., Toronto 2.
 Popular Science Publishing Co. Inc., 355 Lexington Ave., New York, N.Y. No Canadian representative.
 Rand McNally and Co. W. J. Gage Ltd., 1500 Birchmount Rd., Scarborough 4, Ontario.
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 World Publishing Co., The. Nelson, Foster and Scott Ltd., 81 John St., Toronto 2B.

